McVITIE & PRICE'S OATCAKES.

THE PRACTICAL TEACHER

THE YORK CONFERENCE: MR. MARSHALL JACKMAN, President Elect.

CONTENTS OF THE APRIL NUMBER.

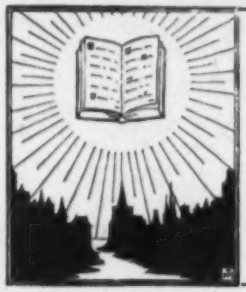
THE ELEMENTS OF SCHOOL HYGIENE. By Arthur Newsholme, M.D., F.R.C.P. .. 507
WITH OUR CHILDREN. By J. Gunn, M.A., D.Sc. .. 509
THE COMING CONFERENCE OF THE N.U.T. AT YORK
THE NEW PRESIDENT OF THE NATIONAL UNION OF TEACHERS .. 513
THE YORK PRESIDENT OF 1875 .. 514
YORK .. 515
EDUCATION IN ENGLAND. N.U.T. Notes, etc. By T. B. Ellery, F.R.G.S. .. 522
EDUCATION IN SCOTLAND. E.I.S. Notes, etc. By James Paterson .. 524
NOTES FROM THE NORTH .. 525
FOREIGN NOTES .. 527
THE COMMON SCHOOLS OF RUSSIA .. 528
FULL NOTES OF TWO LESSONS. By W. Done, B.A. .. 530
BOTANICAL NOTES FOR TEACHERS. By Professor J. R. Green, Sc.D., F.R.S., and F. L. Green .. 531
BLACKBOARD DRAWING. By Edith E. Bamford, Art Teacher, Edgehill Training College .. 532
PRACTICAL ELEMENTARY SCIENCE. By T. Cartwright, B.A., B.Sc. .. 533
THE INSPECTOR'S NOTEBOOK .. 535
OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK .. 536
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. Flux .. 538
OUR CERTIFICATE COURSE FOR 1900. By G. Collar, B.Sc. 543
LONDON MATRICULATION. By R. C. B. Kerin, B.A. .. 546
QUERY COLUMN .. 547
STAR STUDY FOR SCHOLARSHIP STUDENTS .. 549
NOTES ON PHYSIOLOGY .. 550
MATHEMATICS: Stages 2 and 3 .. 551
NOTES ON THEORETICAL MECHANICS .. 552
ELECTRICITY AND MAGNETISM .. 553
NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY .. 555
CHEMISTRY NOTES .. 556
OUR FRENCH PRIZE COMPETITION .. 557
THE EDITOR'S TABLE .. 558

VOL. XX No. 10

EDITORIAL, PUBLISHING AND ADVERTISING OFFICES OF "THE PRACTICAL TEACHER" 35 & 36 PATERNOSTER ROW, LONDON, E.C. NEW YORK OFFICE, 37 EAST EIGHTEENTH STREET.

PRICE 6D.

FRY'S PURE CONCENTRATED COCOA.



Moffatt & Paige,
Publishers,
28 Warwick Lane,
Paternoster Row.

English Classics.

Edited by THOMAS PAGE.

In these Editions, Notes are Classified and Arranged.

Other Works in Preparation.

Specimens sent to Head-masters on application.

THE PLAYS OF SHAKESPEARE.

Contents.—Chief Events in the Life of Shakespeare—Shakespeare's Works—Introduction—Date and Early Editions—Source of the Plot—Sketch of the Plot—Sketches of the Principal Characters—Literary Notes—Notable Passages—Proverbial Expressions and Familiar Quotations—The Text—Miscellaneous Notes—Notes on the Language of the Play—Etymological Notes—Proper Names—Examples of Paraphrasing—Examples of Analysis of Sentences—Anachronisms and a few Typical Questions selected from various Examinations.

Some Reviews:—

Saturday Review.—"Mr. Page has edited English Classics in a manner to command approval."

Sir HENRY IRVING.—"A most faithful and scholarly edition."

Daily Telegraph.—(Julius Cæsar)"....is invaluable as an aid to the study of the play."

South Africa.—"What a handy 'book of the play' they form."

Student's Friend, Bombay.—"Decidedly the very best for students, be they Indian or English."

Athenæum.—"Essentially books for students."

Educational News.—"It would be difficult to imagine anything more perfect than this edition of 'Macbeth.'"

	s.	d.		s.	d.
*AS YOU LIKE IT, ...	2	0	*MACBETH, ...	1	6
CORIOLANUS, ...	2	6	MERCHANT OF VENICE,	1	6
*HAMLET, ...	2	6	*MIDSUMMER NIGHT'S DREAM, ...	2	0
HENRY V., ...	2	6	*RICHARD THE SECOND,	1	6
*JULIUS CÆSAR, ...	2	0	TEMPEST, ...	2	0
KING JOHN, ...	2	0	TWELFTH NIGHT, ...	1	6
KING LEAR, ...	2	0			

* *For Current Examinations.*

BACON.

Schoolmaster.—"The edition will stand as an exemplar."

	s.	d.
BACON'S ESSAYS. Part 1, ...	2	6

Essays I.–XXVI., with Life, Introduction, Notes arranged and classified, Analysing, Paraphrasing, Indexes, etc.

MILTON.

Practical Teacher.—"Marked by those features of almost exhaustive annotation and complete classification of information on which we have commented in our notices of Shakespeare's plays, edited by the same practical hand."

	s.	d.
*PARADISE LOST. Books 1 and 2. (*Just Published*),	2	0
*SAMSON AGONISTES, ...	2	0
*COMUS, ...	1	6
*LYCIDAS, L'ALLEGRO, and IL PENSEROSO, ..	1	4

* *For Current Examinations.*

SCRIPTURE.

Edited by R. J. WOOD, B.A.

Educational Times.—"One of the fullest and most conveniently arranged handbooks on the Gospel."

	s.	d.
MOFFATT'S GOSPEL OF ST. MATTHEW, ...	1	6
MOFFATT'S GOSPEL OF ST. MARK, ...	1	6

Contents.—Life of Author—Notices of Gospel, Date, Place, Language, Design, and Characteristics.

New and Illustrated Catalogue of all Publications, etc., for 1900, now ready. Post free on application.

MOFFATT & PAIGE., Ltd.

ERNEST A. PAIGE, *Managing Director.*

AYRES' CERTIFICATE AND SCHOLARSHIP CLASSES.

ORAL CLASSES

MEET AT THE

Ward Schools, 181 Aldersgate Street and 16 Bridgwater Square, E.C.

SCHOLARSHIP CLASS.

New Term begins on March 31.

BEST OBTAINABLE PREPARATION GUARANTEED.

CORRESPONDENCE CLASSES.

Special Points in connection with the Class:—

1. Work is regularly sent and promptly returned.
2. Solutions are given to all Arithmetic, Algebra, Parsing, and Analysis, with full Explanatory Notes.
3. Model Answers are sent weekly to all typical Questions, Essays, etc.
4. Special Courses of Papers in all subjects are given.
5. The Course of Papers includes all the most recent Questions.
6. The Fee is strictly inclusive.

New Term begins March 30.

CERTIFICATE CLASS, 1901.

Preliminary Class will begin in April.

(Names can now be entered.)

Intending Students should join as soon as possible.

KINDERGARTEN CORRESPONDENCE CLASS.

For Prospectus, References, Testimonials, etc., apply to

Mr. H. B. AYRES,

4 ARUNDEL SQUARE, BARNSBURY, LONDON, N.

THE

PRACTICAL TEACHER

A MONTHLY MAGAZINE AND REVIEW FOR THE SCHOOL-ROOM AND THE STUDY

Vol. XX. No. 10. APRIL, 1900. Price 6d.

NOTICES TO CORRESPONDENTS AND SUBSCRIBERS.

☞ ***Subscribers who do not receive the SUPPLEMENT presented with this Number are asked to promptly communicate with us, and to send at the same time name and address of Bookseller or Newsagent through whom the Magazine is obtained.***

All literary communications should be addressed :—
Office of "THE PRACTICAL TEACHER,"
35 and 36 Paternoster Row, LONDON, E.C.

"THE PRACTICAL TEACHER" may be ordered of any Newsagent, Bookseller, or at any Bookstall in the United Kingdom.

Subscribers wishing to have the Journal posted regularly to them from this Office can subscribe upon the following terms :—

	One Year.	Half Year.
United Kingdom, Continent, Colonies, and United States	7/-	4/-

REMITTANCES, POST-OFFICE ORDERS, CHEQUES, etc., should be made payable to HENRY SCHERMUIER.

Rates for Advertisements upon application.

"THE PRACTICAL TEACHER" may be ordered through all Colonial Booksellers and Newsagents. Monthly supplies are regularly sent to the chief towns in Australasia, South Africa, and India. Copies can also be obtained at our

NEW YORK OFFICE: 37 East 18th Street;

AND AT

PARIS: Neal's Library, 248 Rue de Rivoli;

BERLIN: Gsellusische Buchhandlung, Mohren Strasse.

THE ELEMENTS OF SCHOOL HYGIENE.

BY ARTHUR NEWSHOLME, M.D., F.R.C.P. (LOND.),

President of the Incorporated Society of Medical Officers of Health; Examiner in State and Preventive Medicine to the Universities of London and Oxford.

INFECTIOUS DISEASES IN RELATION TO SCHOOL LIFE.

THIS question is most important, both from the standpoint of those responsible for the public health, and from the teacher's standpoint, because no other diseases diminish the average school attendance so seriously as these do. As the efficiency of a school and its position in relation to other schools depends on its "average attendance," the contents of this article and of those to follow it deserve careful study by the teacher. Happily, the best means which the teacher can use to bring the average attendance to a maximum are by co-operating, in the manner to be hereafter indicated, with the medical officer of health. It is a fundamental mistake for the former to imagine that he or she will improve the average attendance by hastening the return to school of children suffering or suspected to be suffering from slight attacks of illness. Such children, if they attend school, whether in consequence of the pressure brought to bear upon their parents by the school-attendance officer or the teacher, or in consequence of the carelessness of parents, are the most fertile source of school epidemics; whereas, by co-operation with the medical officer of health, they can be isolated, their attendances can be included by the certificate of that officer in the average attendance and grants claimed for them, while no danger to other scholars is incurred.

To what extent do schools spread infectious diseases?—These diseases are conveyed by particles of matter given off by the infectious patient, and carried directly from the patient to the infected child, or indirectly by such particles of matter which has become attached to the personal apparel of the patient, or to that of healthy children from the same house, or to books or other articles which have previously come into contact with the patient. This particulate matter, containing the living germs of the disease in question, may be so minute as to be invisible to the naked eye. It may be finer than the dust which floats in the air of every occupied room, and, like it, can be disturbed and spread about by the active movements occurring in every school-room. These general considerations leave no doubt as to what answer must be given to the above question. It would be more than surprising were the conditions of school life not provocative of a large amount of infectious disease. The intimacy of close personal contact between scholars in the same class, closely massed together, must necessarily give numerous opportunities for the spread of infection. In scarlet fever and diphtheria the infection is located largely in the throat; and it is only necessary to recall such common practices as passing on sweetmeats from mouth to mouth, turning over leaves of books with wetted finger, spitting on slates in connection with their cleansing, etc., to realise how

Next Month:

CONFERENCE DAY BY DAY.

Illustrated.

commonly disease must be spread in this way, when children with mild "sore throats" are allowed to attend school.

The experience of every medical officer of health teaches him that schools are frequently a centre of infection, and that he can only obtain complete control of a particular epidemic by excluding children from all suspected families, or even by entirely closing a school or one department of it in which the cases of infectious disease have occurred. It is not necessary to detail instances bearing out the above facts; many such are to be found in medical and sanitary journals. Mr. Shirley Murphy has shown that in London, when allowance is made for the period of incubation of these diseases, there has been for several years a marked fall in the number of cases of diphtheria and scarlet fever notified for the three or four weeks embracing the August–September summer school holiday—the effect being most marked for cases at ages three to thirteen, the years of school attendance. It is only right in this connection to quote the remarks I have made elsewhere to the following effect:*—"It is, however, one thing to admit that school attendance, in common with all other means of personal communication between susceptible persons (of whom scholars at elementary schools form a vast majority), is an important factor in determining the extent of the spreading of diphtheria, and another to attempt to explain, as some have done, the recent epidemic of diphtheria in England as if it were caused *chiefly* by the increased enforcement of compulsory school attendance. Mr. Murphy is satisfied to show that *school attendance is a means of spread of diphtheria.* With that all must agree, and must further agree as to the urgent necessity for additional precautionary measures in connection with the close aggregation of children in elementary day schools. Others, less judiciously, attempt to explain the entire or the greater part of the recent increase of diphtheria in England as due to school attendance. Such a notion will be corrected by looking at diphtheria from an international standpoint. Notwithstanding its enforcement of compulsory school attendance since 1871, London, even in its maximal epidemic year (1893), presents no more diphtheria in proportion to their respective populations than is constantly endemic in Paris or Berlin."

Does any good accrue from keeping away from school healthy children from infected houses?—Most teachers will admit the necessity for isolation of infectious patients. Many, however, deny the necessity for keeping from school the healthy or apparently healthy children from infected houses to the extent to be shortly described. They are supported in the following words from a foreign medical authority:—"It seems to me that every assemblage of children facilitates the propagation of diphtheria. It is evidently impossible to prevent children—and especially children of the lower classes—from assembling. If they are not sent to school, they will assemble, all the same, to amuse themselves. In this case there will be no supervision, and there will be greater opportunities for them to infect one another than if they were in a school. .....Of all the opportunities that children have of assembling together, that which school affords them appears to me the least dangerous." I have quoted these words in full, so that the case for their contention may be stated as strongly as possible. They do not, however, present a true picture of the conditions of school life in this country. A scholar from an infected house, possibly conveying infection in his apparel or in his own throat or skin from an unrecognised attack, does not, particularly in the lower classes, which are chiefly affected, constantly occupy the same seat. He is not always seated next to two particular children throughout the school session. His position may be moved several times in the same day, and he thus has opportunities for sowing infection in children—not those who live in the same street, but in different parts of the same town, thus originating fresh *foci* from which disease can spread. On the other hand, if kept from school he may, notwithstanding directions to the contrary, play with other children in the street or in a neighbour's house. Out of doors the danger of infection is greatly diminished; indoors it is limited to neighbours, who already know the possibilities of danger. There can be no reasonable doubt that the risk under the latter circumstances is much more limited and less operative than when the suspected child attends school.

Dangers of children attending school while suffering from an infectious disease.—The Legislature has now provided means by which this danger is minimised, so far as each of the chief infectious diseases—such as small-pox, scarlet fever, and diphtheria—is concerned. It is made compulsory, both on the parent or guardian and on the medical practitioner, to notify each case to the medical officer of health as soon as they become aware of its existence. In most districts, however, measles, whooping cough, chicken-pox, mumps, and such-like diseases are not compulsorily notified, and the teacher must take the initiative in preventive measures if the rapid spread of these diseases in the school is to be avoided. Even so far as the major diseases above mentioned are concerned, cases occasionally escape detection. Scarlet fever and diphtheria, for instance, are sometimes extremely mild in character; the mother may think a doctor unnecessary, and a week or ten days after the commencement of what was thought to be an innocent sore throat a scholar returns to school in a condition in which he can inflict great mischief on the other scholars. For these reasons it is important that every teacher should be familiar with the natural history of these diseases. When a child receives infection, there first occurs a latent period, or *period of incubation*, in which no symptoms occur, and the patient is not infectious. After a varying interval the patient is seized with the *symptoms of onset.* At this time he may be attending school, and he is capable of spreading disease from the first moment that these symptoms occur. Indeed, contrary to the prevalent idea, such diseases as scarlet fever and diphtheria are, I believe, more intensely infectious in the first three days of the attack than at any later period of the disease.

In **Scarlet Fever*** the onset is usually sudden. Vomiting, or what is known as a "bilious attack," very often is the first symptom of scarlet fever. The patient complains of a sore throat, and has a hot, dry skin and a rapid pulse. Within twenty-four hours a red rash appears on the chest, soon becoming a scarlet flush, and spreading all over the body. After a few days, seldom delayed beyond the end of three weeks, the skin "peels" off various parts of the body. On the hands and feet the skin looks ragged. There may be "pin-holes" in these parts, which, along with the ragged appearance, are fairly characteristic. In some cases the initial symptoms are very slight. If any scholar is found

* *The Origin and Spread of Pandemic Diphtheria.* (Swan Sonnenschein and Co., 1898.)

* Scarlatina is identical with scarlet fever, notwithstanding the common impression that the two names represent different entities.

BRITISH MUSEUM

with rough hands, with discharge from the ear, or with sores about the nostrils, and with a history of a feverish attack or sore throat two or three weeks earlier, he ought to be sent home and a medical inspection required.

The onset of **Diphtheria** is less sudden. The sore throat comes on rather gradually. White patches can usually be seen on the tonsils when the tongue is depressed. It is not necessary that an exact diagnosis should be made, because *every child suffering from sore throat should be regarded as dangerously infectious.* If the glands of the neck below and behind the lower jaw are enlarged, the case is still more suspicious. Diphtheria is regarded as a very serious disease, and if a scholar with a sore throat is not very ill with it, this is considered to be good evidence that there is no diphtheria. Nothing could be more fallacious than this. Diphtheria may be so light that the patient himself may complain but little. Hence the importance of the rule that every sore throat should be regarded as infectious until proved not to be so. In many large towns facilities are provided for the gratuitous bacteriological examination of "swabs" taken by brushing the interior of throats of suspected patients. Such an examination frequently reveals the presence of diphtheria in throats where a doctor would be unable positively to certify its presence on the strength of a naked eye examination. There is little doubt that in the near future this additional aid in keeping diphtheria out of school will be largely utilised.

Eminent hygienists have laid stress on the "progressive development of the property of infectivity" of sore throats in connection with the crowding of school life. Whether by this means an innocent may become a malignant sore throat (diphtheria) is doubtful; but that an evil and insalubrious environment may convert a mild into an extremely severe diphtheria is, I think, certain.

It is important to remember that the infection of diphtheria may lurk in the throat, and be capable of being passed on to healthy children, for some weeks after all evidence of illness has disappeared. This is particularly apt to occur after those slight attacks which have not been regarded as diphtheria, and in which the appropriate treatment has not been adopted. Cases regarded as "sore throat," a "bad cold," an "ulcerated throat," may really mean diphtheria. Hence no scholar should be allowed to return to school after any form of sore throat until a medical certificate has been obtained of freedom from infection; and in towns where the means are available, this should not be given until a bacteriological examination of some of the mucus from the patient's throat has been made.

Smallpox is a possible source of infection, when this disease is prevalent in a district. In severe cases the patient is too ill to attend school. The only possibility of school attendance is when a scholar who has been imperfectly vaccinated suffers from an attack of "varioloid," or modified smallpox, in which the only evidence of disease may be the occurrence of a few pimples or pustules, chiefly to be seen on the forehead. Among scholars imperfectly vaccinated or unvaccinated such a case might cause a serious spread of disease.

In **Chicken-pox** there are usually (unlike smallpox) scarcely any premonitory symptoms before the pimples appear. These rapidly become clear vesicles, and then dry off or form scabs.

Measles begins with all the symptoms of a bad "cold in the head," with running at the eyes and nose. At the end of seventy-two hours red, blotchy spots appear on the face, hands, and other parts, rapidly becoming general, and often showing crescentic arrangements. Influenza and an ordinary "cold" begin in the same way. As both these are extremely infectious, the safe plan is to send any scholar home who is suffering from the symptoms of severe catarrh, especially if measles is prevalent at the time.

Rötheln, or **German Measles,** has a rash somewhat similar to that of ordinary measles. This is, however, preceded not by nasal catarrh, but by a sore throat—a fact which has occasionally led to mistakes between this disease and scarlet fever.

Mumps comes on with pain near the ear, and enlargement of the parotid salivary gland, which causes a bulging out at the side of the neck, *and in front of the ear,* by which means it can be distinguished from enlargement of glands due to other causes. Occasionally it affects only one side, usually both sides.

Whooping Cough is a disease in which the characteristic "whooping" cough does not come on for a week or two, but the cough appears to be due simply to bronchial catarrh. The disease, unfortunately, is infectious during this stage. In judging of the character of a cough, the history of other cases of whooping cough may help in the diagnosis. Every teacher should be familiar with the "whoop" which is characteristic of more advanced whooping cough, and send any child home who has it, or who even without it has *a cough severe enough to make him vomit.*

WITH OUR CHILDREN.

BY J. GUNN, M.A., D.SC.,
Author of "Class Teaching and Management," etc.

Some Objections to Child-Study.

CHILD-STUDY is taking, if it has not already taken, a definite place in the range of studies bearing on education. The name is new, but not the thing. It is older than the office of the teacher; one may safely assume that the first student of the child was the first mother. But with the rise of the office of teacher child-study entered on a new phase. Every theory of education rests by implication on two fixed points—the *terminus a quo* and the *terminus ad quem.* The theory has for its beginning the child as he is, and for its end the child as it is desired to make or to mould him. And not only does a theory of education rest on the child at its terminal points; every step of method has the nature and capacity of the child as its foundation—if it has any foundation at all, and is not suspended in mid-air, as too many educational theories are.

Every period of educational reform has been ushered in and characterised throughout by a closer study of child-nature, just as every period of decay has been characterised by, if not caused by, neglect of the chief factor in education—the nature and needs of the child. It is, therefore, a hopeful sign as regards education at the present day that the study of the child is occupying the attention of a large and increasing number of teachers and others interested in the training of children.

Numerous references in the educational press to recent experiments in child-study cannot have escaped the notice of readers of this journal; nor can it have been unnoticed that these references have almost uniformly been of the nature of adverse criticisms. Some of them, indeed, must have awakened a feeling of disappointment, not as regards child-study, but as regards the papers which have assumed this position. "Howlers" culled from the examination papers of children and older students have long been familiar, from the popularity which they enjoy in the daily press and elsewhere. They are quoted even in the educational press, frequently with the deprecatory air which is meant to convey the impression that such things are really beneath the dignity of

serious organs; which is quite proper and harmless, and deceives nobody. In the same way, and equally naturally, absurdities are gleaned from the replies given to the queries of some student of children, and quoted with the orthodox frown. Indeed the frown is a trifle more heavy, for obviously the inquisitors in this case have no official standing: they are mere amateurs, and for them to raise the laughter of the Philistines against anything educational is inexcusable; they are not even paid for asking questions. The dignity of education is wounded in the house of its friends. But child-study is not productive of absurdities alone; it is not even conducted solely through schedules of queries and tabulated statistics of the answers given. It would be as unfair to assume this as to assume that all examination questions produce "howlers," and that all "howlers" are preserved for use as "copy." Such a view, however unfair, might be excused in publications which have not the qualifications for judging on technical points connected with education; but in the educational press one would fain see a more serious view taken of all educational experiments.

Yet even here one should not take too gloomy a view. It has been the misfortune of our country that educational discussions of the most urgent kind have had to be carried on regarding almost everything but education itself. We have not had leisure yet to consider our definition of the thing round which our wars have been waged. And as for programmes and methods, these have been settled *for* educators, but not *by* educators. Hence the stress of practical needs has imposed on the most important organs of our educational press a character which is not specially suited for the treatment of education in its experimental aspects or in its fundamental principles. This remark is not to be understood as implying blame; it is merely a recognition of the special form which circumstances have imposed upon our educational organs, and it is only fair to recognise that these organs, by their yeoman service in the struggles for educational freedom, have done much—very much—to bring about the condition which every educator longs for, when education itself will be the central subject in educational discussions. But as that time still seems somewhat distant, we must meanwhile recognise that the paragraphs which have recently appeared with reference to child-study cannot be taken as any serious estimate of what that study aims at or has accomplished.

A little wholesome ridicule is not a bad thing for an earnest investigator. All beginnings are ridiculous to certain classes, such as those who are proverbially bad judges of half-done work. To the "man in the street," who is no doubt the traditional "schoolboy" come to man's estate, we can always reply, "*Ne sutor ultra crepidam*," which relieves our feelings without disturbing his serenity. But the criticism of a professor of education, a recognised master—and in many points the highest living authority in his subject—cannot be so easily dismissed. Professor Laurie, in the new edition of his most valuable and suggestive *Institutes of Education*, has the following pithy footnote: "From my knowledge of the adult completed human being I must interpret child-growth. A great deal of rubbish has been shot into the educational field by the fanatics of 'child-study.'" This, at first sight, seems to indicate that the learned professor has little sympathy with child-study, and entertains a low opinion of its educational value.

Such a view, however, is untenable by any one who reads the book. It is evidently the work of one who has studied children to some purpose, and many of its positions can be intelligently appreciated only by those who have likewise a fairly thorough knowledge of children; by others the statements can only be accepted on the writer's authority, and this, we presume, is the last thing he would desire. There are minor points, perhaps, on which a reader may differ from him, such as the most suitable age for certain studies. And here, again, the difference of opinion can only be justified, or the reverse, by the results of further study of children. The professor's position, as indicated in the words, "From my knowledge of the adult completed human being I must interpret child-growth," is precisely the position of every intelligent student of children. Such students would merely add, by way of explanation, that in order to have anything to "interpret," they must "observe" the child in its growth. This is implied in the sentence quoted, and adds nothing inconsistent therewith. The second sentence of the footnote is really more harmless than it looks. "Fanatic" and "child-student" are by no means convertible terms—they approach more nearly towards the incompatible; while a survey of the educational field is apt to suggest the opinion that those who have been most active in shooting rubbish thereon are precisely those who knew least about children. On the whole, we may extract a morsel of sweetness from the strong by basing our definition of child-study on the professor's note, and describing it as the interpretation of the observed facts of child-growth from our knowledge of the adult completed human being, and taking to heart his implied warning that fanaticism, even in a worthy cause, is productive of rubbish.

An Experiment and a Comparison.

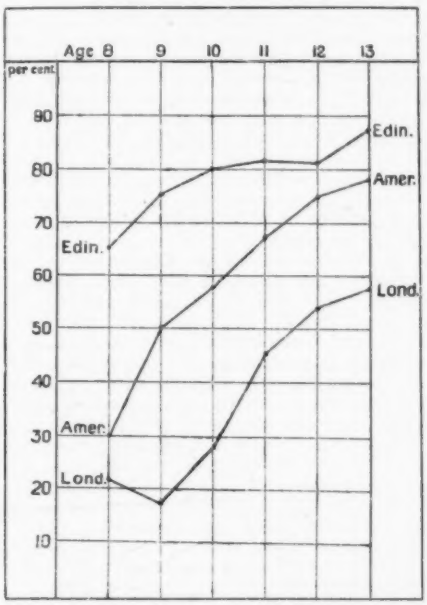
Some interesting experiments have recently been reported regarding children's ideals. These experiments were begun by Mrs. Estelle Darrah-Dyke, of Stanford University, U.S., in 1897. The question she proposed was this: "What person of whom you have ever heard or read would you most like to resemble? Why?" Answers were collected from 1,400 children in American elementary schools, and the results were tabulated and published in *The Popular Science Monthly*. Under the direction of Professor Earl Barnes, of the same university, the same question was proposed to 2,100 children in London Board schools, and the results were tabulated for comparison with those obtained in America.

As regards the first part of the question, it seems at first that classification of answers would be a matter of extreme difficulty, to say the least. But, as a matter of fact, all possible persons chosen will fall into one of two broad divisions: (1) Persons in the immediate circle of acquaintance of the child; and (2) persons in the wider circle made known by reading or from oral instruction by the teacher. Apart altogether from the character of the person or the reason for choice, it is therefore possible to judge how far children of the various ages examined have begun to form ideals from the wider circle mentioned, in America and in London respectively. In this way Professor Barnes was able to show that at any given age the percentage of children selecting ideals from the wider circle was much greater in America than in London, and the deduction seemed clear that the American teacher gave his pupils a wider outlook than the English teacher. The professor may be excused for finding in this result another proof, to add to the already sufficient number, of Transatlantic superiority in general, and in every particular as well.

After a very interesting lecture and conference under the auspices of the Edinburgh Child-Study Association, Professor Barnes's visit led that body to make a similar experiment with 2,500 Edinburgh children, almost wholly in Board schools (the exact proportion was 93 per cent.). The query was put in precisely the same words, and the tabulation of answers was made under the same headings, to admit of comparison with the American and London results. And now a very curious state of matters emerged. As regards the proportion of children choosing their ideal from the wider circle referred to, the Edinburgh schools showed results almost as much above those of America as these did above the London schools. What this may really imply the members of the Edinburgh Association are, of course, too modest to say. They have simply made the comparison, and found that to be the result. In view of Professor Barnes's deductions from the earlier comparison, however, it seems a result worth putting on record, more especially on account of this fact, that if the mean between the London and Edinburgh schools be taken to represent the schools of our effete Monarchy, the resultant curve differs so little from that afforded by the youthful Republic that there is little room for arguing much superiority in educational results on the one side or on the other, when judged by such a test as this. The results from the three sets of schools have been given in diagrammatic form, to avoid the "intolerable strain" of interpreting figures.

To one who has studied, and to some small extent shared in such an inquiry as that referred to, there is no end of

valuable lessons available, and these are by no means always in the line along which information was expected. For instance, one must not accept the curves given as indicating



PERCENTAGE OF CHILDREN (APPROXIMATE) AT AGES SPECIFIED WHO SELECT THEIR IDEAL FROM THE "WIDER CIRCLE."

the rate at which children find ideals in the wider circle in preference to the narrower circle of personal acquaintance, though that would seem at first sight a perfectly fair deduction. For, observe, the question is as to persons "of whom you have *heard* or *read*," not "or whom you personally *know*." There is here a direct check upon mentioning acquaintances, and this has no doubt led many children to select historical or public characters, under the impression that the home circle was barred. This defect in the question was pointed out to Professor Barnes at the Edinburgh meeting as a possible explanation of the few answers which mentioned the teacher as an ideal, and apparently it had not previously been noted. It was only in order to obtain the conditions necessary for a just comparison that the question was put in the unmodified form in Edinburgh schools.

Again, it was pointed out that the number of literary characters chosen in London was much below the proportion in American schools. In connection with this, a friend recently put into the hands of the writer an American school book for young children, where Lord Tennyson was prominently mentioned, and the notable fact about him that he sometimes received as much for his poems as came to a stated number of dollars per line. Now this would be a memorable fact for a youngster who had till then looked on writing as something to be avoided and of little use to anybody in real life. A shrewd lad with this fact in his memory would be much more likely to name Tennyson as his ideal than, say, a London boy who only knew him as the man who wrote "The May Queen," or "The Brook," or some other poem which had cost the said boy several hours' hard work to memorise. It is not logical to generalise from a single instance, but this is at least a negative instance to be reckoned with before we can infer from the statistics referred to any great inferiority in literary teaching among our schools. That there is more attention paid to literature in American schools is, of course, a known fact. The mere difference in the complexity of the coinage is an advantage for the American teacher; how much more time would be available for the study of literature in an intermediate standard if we had a simple decimal coinage to deal with! (There *is* a connection between literature and dollars after all!)

In one point, perhaps, the American and the Edinburgh children are both more favourably placed than those of London for finding an ideal in the wider circle, and that is as regards the semi-domestic heroes with which those children are early made familiar. It is doubtful whether there are any names of the heroic type made so thoroughly familiar to English children of tender years as are Washington and Lincoln in America, or Wallace and Bruce in Scotland. Nelson and King Alfred, perhaps, approach nearest these; but the four first mentioned seem to have an advantage in their very narrowness of sphere, if one may use such a term without offence. It seems, at any rate, as if this were a factor to keep in mind in making any wide generalisations from the curves given.

Professor Barnes, and, following his example, the Edinburgh Association, also attempted a classification of the answers given to the second part of the question,—"Why?" It is hazardous to make any comparison of results here. In the first place, it is always easier to say *what* one likes than *why* one likes it, and the first part of the answer may therefore be regarded as much more certainly an index of the child's thoughts than the second part. Again, it would be impossible to make a fair comparison between groups classified by different workers. An answer which one might place under the heading of "Ambition" might very well be placed by another under "Wealth," or some similar motive; while no proper account can be given of answers which avow more motives than one. Yet, to a certain extent, the answer to "Why?" is a better index of the child's thoughts than the former. For example, a very large number of Edinburgh boys took the Prince of Wales as their ideal; and this could easily be traced to the fact that he had recently paid a visit of ceremony to the city. The mention of his *name* was, therefore, so far an accident; the *reason* for the choice was somewhat more of a constant quantity, and would have led to the mention of some other person of high rank, had such a person been locally prominent instead of the Prince. And this result of an accidental coincidence seems to invalidate any attempt to base on these answers any conclusions regarding the relative popularity of certain individuals among children. Accident of time and place will do much to determine which individual is selected as a type of the class which appeals to the child as a desirable ideal. Here, at least, the reason is more significant than the name.

"The National Review" Article.

A recent article in *The National Review* by Miss Dodd has been much quoted and much criticised. The quotations, as is natural, have been made on the principle which frequently aroused the ire of the late Professor Blackie, who was in the habit of saying, regarding the newspaper reports of his sometimes erratic speeches, that the reporter had an infallible instinct for picking up the chaff and neglecting the wheat. This instinct is perfectly natural and justifiable from the newspaper point of view—that of supplying what is most in demand. Wheat requires some culinary treatment to make it digestible or palatable, and one expects his newspaper pabulum to be ready cooked. Chaff, on the other hand, can be served up dry; not as food, indeed, nor for any useful purpose, but—let us not strive to force the metaphor further—chaff is nevertheless popular.

Passing to the criticisms, it may be broadly stated that they have rarely been serious, and still more rarely sound. In one case, indeed, Miss Dodd is accused of complaining that children's knowlege of poets and their works is imperfect, and their literary criticism crude—which would be a mere truism as regards nine-tenths of adults as well—while her real point is that, despite this fact (which she was probably aware of previously), "the aspiration towards the ideal is deeply rooted."

Miss Dodd's article is, thanks to abundant quotations from the children's answers, a most interesting one; and one could point to much in it that completely upsets some theories of those who profess to know children much better than child students do, but—there is a *but*. To put it shortly, there are many engaged in child-study who regret its appearance.

In the first place, it has done much to foster the idea that

the purpose of such schedules of questions is to afford material for a dilettante enjoyment of children's sayings—an idea which seems to exist in many quarters, and which the writer of the article would doubtless be very far from wishing to encourage. Experiment has a definite place in study, but this use of an experiment savours of the popular lecture-hall rather than of the laboratory.

Again, while the results of experiments may be published with advantage, the manner and the medium of publication should be carefully considered. In the medical profession, and in the legal profession, a certain professional etiquette of reticence is observed in choosing the organs through which professional matters are discussed. One does not expect the hospital practitioner to provide entertaining reading for the general public from his "cases," but rather to record what is valuable in the organs of his profession, or in the transactions of some society capable of appreciating his discoveries. True, our profession is not so well supplied as it might be with corresponding means of making known educational discoveries or attempts at discovery; but that cannot quite excuse the treatment of purely professional experiments as matters for the entertainment of the general public, who are sure to mistake wholly the proper aim and purpose of such work.

More than this, it is impossible to present such matters to the lay reader in a way which shall be at once entertaining to him and useful to science, and the latter aim is in danger of being sacrificed to the former. The articles in a popular journal must first be readable. This is not a necessity in scientific papers; they must first be accurate.

These "grumbles" are by no means intended to express an opinion hostile to such inquiries in child-study, but only to point out the dangers which, in the opinion of some, attend the injudicious use of materials which may be of considerable intrinsic value.

As regards Miss Dodd's deductions from her material, there seems need for observing that in one particular at least her conclusions go somewhat beyond the warrant of her experiment. She concludes that "the range of ideal personages known to the school children is extremely limited." (By "ideal," probably, we are to understand well-known personages whom children might "wish to be" or to resemble.) Now, it is to be borne in mind that each child was expected to name only *one* such person. If all the boys of a military ambition were to select, say, Lord Roberts, it would be quite unwarrantable to infer from this unanimity that he was the only military hero known to them. Before one could argue a limited range in their knowledge of such heroes, a question of a totally different form would have to be proposed to them. So with poets. The large percentage mentioning Shakespeare or Kipling gives no warrant for inferring ignorance of Milton or Longfellow. It might be quite possible by means of judicious questions to find out how many great personages, or at any rate great *names*, are known to children; but this would be less a matter of child-study than of school-examination, and of that we have probably sufficient for our daily wants already.

How they Manage it in France.

So far as external conditions go, child-study in France enjoys advantages unknown to us. In the department of the Nord it has the official aid and sanction of the late director of primary education, the inspector, and the professor of education in the University of Lille. When British investigators receive similar support and patronage, child-study may become respectable, even in the eyes of the educational press. But external circumstances are not everything in scientific research. There is a certain value to be attached to scientific insight in the investigators.

The "Enquête Pédagogique" reported in *La Revue Pédagogique* is a little puzzling. One seems to feel that it was an attempt to find out everything about children at one stroke. Its comprehensiveness is almost appalling. No less than forty-one questions were presented to 37,000 children, each to be answered "Yes" or "No." It would occupy, perhaps waste, a considerable space to reproduce all those questions here, but it may be interesting to indicate some of them. It is impossible to give a selection which would be a fair sample, as they refuse to be averaged or generalised.

The young people were asked to confess which school subject they liked, and which they disliked; whether they were ever late or absent, came to school willingly, and went straight home; whether they read library books, and paid their subscription, and whether they read other books and magazines; also whether their parents read the library books; whether they had a savings-bank book, and whether they had spent all their New-Year "tips;" whether they had a "chum," and if so, whether older or younger than themselves; whether they had ever smoked, and if so, a pipe, a cigar, or a cigarette; whether they loved and cultivated flowers; whether they would like to be rich; whether they were happy; and whether they hoped to be happier after leaving school. There were, of course, other questions, we dare not say similar to these, or to any one of them, but in some ways of less interest.

To receive and enumerate the answers, which were evidently nearly equal in number to $37{,}000 \times 41$, allowing for the probability that girls would not be expected to answer the questions regarding smoking, must have been a somewhat laborious task, and the directors of the "Enquête" may fairly congratulate themselves upon the accomplishment.

We are not told exactly what knowledge of children the questions were designed to discover, and accordingly we need not complain that the total value of the results is not estimated. The notes contributed regarding the results add little beyond what is evident from the figures.

It may be noted that 14,404 boys confess to having smoked, while 5,869 answer "No." We are constantly told by critics that children always *pose* when questioned in this wholesale manner, and never reveal their true selves. The writer of the article in question well remarks that this result seems to dispose of such an objection, while in other respects it may not be very gratifying. Even if we agree with such objectors, and assume that the 14,404 boys have never really smôked, but only pose as smokers (to please their teachers, presumably), it seems to indicate so high a reverence for smoking as an ideal that we may assume they will shortly attain it. The fact is, any answer which a boy can give to a question will reveal *something* to a careful observer, though that something may be very different from what the boy intended to reveal. Even to *pretend* to be or to admire shows a certain kind of appreciation of the pretended ideal. Hypocrisy is said to be the homage which vice pays to virtue, and this definition may be recommended to the consideration of those who think it impossible to know anything of a child's mind from his answers to questions. But in this French experiment one cannot but be struck with the evidences of truthfulness in the answers. The children evidently felt that they were in the confessional, and acted accordingly. All the same, one cannot help wondering just why those questions were put.

The whole *enquête* suggests a general ramble over the field to see what would turn up, rather than a search for some definite object, whose presence was to be proved or disproved. The purpose cannot have been merely to gain information regarding the children on the points mentioned. On many points, such as regularity at school and use of the school library, accurate information could have been easily obtained from the teachers themselves. In the meantime we must hold in suspense our judgment as to the success of the experiment until we have some information regarding its aim.

ELEMENTARY SCHOOL TEACHERS' (SUPERANNUATION) ACT, 1898.

THE EDUCATION DEPARTMENT desire to call attention to the fact that Saturday, the 31st inst., is the latest day on which teachers certificated before the 1st April 1899 can give notice of acceptance of the Act. Any such teacher who does not duly accept the Act on or before that date is finally precluded from its benefits.

The Code for 1900 provides that no application for a pension under Article 130 will be entertained unless it is made before the 1st April 1906.

Teachers who have accepted the Act, but who have not received an acknowledgment of their acceptance, should communicate at once with the Secretary, Education Department, Whitehall, London.

THE COMING CONFERENCE OF THE N.U.T. AT YORK.

THE NEW PRESIDENT OF THE NATIONAL UNION OF TEACHERS.

MR. MARSHALL JACKMAN.

THE presidential chair of the National Union of Teachers is not to be won by merely waiting. It does not circulate among greybeards who have only grown white in the placid and non-committal discharge of office. True, it is a recognition of arduous and successful service, but the gratitude that inspires it is deeply tinged with a lively sense of favours to come. We all expect something great from a new president—some inspiration and impulsion in a new crusade; and as each aspirant for the supreme honour of the N.U.T. is usually a man who has made himself the master and the mouthpiece of some particular reform, we are not often disappointed.

MR. MARSHALL JACKMAN.

Those who know MR. MARSHALL JACKMAN, the new President of the N.U.T., are fully assured that some very distinct advance will mark his year of office. Those who have watched his career on the Executive will tell you that no man has left his mark broader and deeper on the policy of the N.U.T. All along, in his far-seeing, shrewd way, he has perceived that a strong, well-financed Union need not sue for justice and adequate recognition, but can demand it of right. He has laboured in a pre-eminent degree to build up the machine, to give it weight of numbers, the sinews of war, to co-ordinate its parts, and to secure a unison of action in its great movements. As chairman of the Organisation Committee, as critic and reorganiser of the Union's funds, as the originator of the round table at which local presidents and secretaries sat in 1894, and as the diplomatist who weaned a certain section of London teachers from a course which would have endangered the National Superannuation Scheme, Mr. Jackman has laboured hard and well, and has done conspicuous service in making the N.U.T. an engine of such great potentialities.

He has done more. His hand turned on the steam of the "forward" movement, which has still a long journey to make before it pulls up at the station of reasonable security of tenure. He was not even a member of the Executive when he went down to Wimblington in 1892 and took a leading part in rousing the locality to a sense of the glaring injustice that was being perpetrated in its midst. It required more than threats of physical chastisement to deter him then; and one rejoices to see that he is still faithful to his first love, and that security of tenure is even now in the forefront of his programme. Every member of the Union will re-echo the earnest wish that Mr. Jackman's devotion to this branch of Union work will receive its recompense in a definite settlement of the question before his year of office is out.

The Schoolmaster has christened Mr. Jackman the "Babbage" of the Union, and no man better deserves the title. Few men have so consuming a passion for figures, and few men have been able to make them reveal more. One need only mention Mr. Jackman's *Pedagogue and Policeman* and his *Education and Crime* by way of illustration. These illuminating tables called national attention to a scandal and an encouragement—the one in process of amelioration, the other still a doubtful matter of belief in certain influential quarters. There were some hypersensitive teachers who objected to the comparison of the teacher with the blue-coated guardian of the public peace, as being derogatory to the dignity of our profession. The only indignity, to my mind, was the fact that the nation could permit a state of things to exist in which such a comparison was possible. Personally, my objection—purely an academic and trifling one—was to the label "Pedagogue." Mr. Jackman does not need to be told that the pedagogue was a mere "child-minder," a mere slave, who conducted his charges to and from school. We claim to be considerably more than that, as Mr. Jackman would be the first to contend. However, I know well he was merely allured by alliteration's artful aid in the selection of a catching title. But, after all, this is mere cavilling. The value of Mr. Jackman's researches nobody can deny. They are eloquent testimony alike to his mathematical ability and to his earnest regard for a right national appreciation of education. A very special feather in Mr. Jackman's cap was his "masterly analysis" of the London School Board Scheme that purported to do justice to the class teachers in its employ. Mr. Jackman's conclusions were irresistible, and one does not wonder at the very hearty and ungrudging thanks voted to him by the M.B.T.A. Indeed, in the matter of thanks for benefits received, Mr. Jackman's cup runs over. The three largest teachers' associations in the country have, for this special work, expressed their deep obligations to him. It is very auspicious that a man of such sound actuarial knowledge should hold the reins of power at the present time. The Superannuation Scheme needs a deal of improvement; and the Union's Ancillary Scheme for the return of Superannuation contributions in case of death—a pet project of the new President's—is in its initial stages.

Mr. Jackman's fame has gone forth as a first-class fighting

man. He is absolutely fearless and unremitting in attacking a genuine grievance. Personally an admirable and most enterprising teacher, he has in the past suffered much professional eclipse from his inability to maintain silence when injustice and error were in the ascendant. Chairmen of School Boards are not wont to smile approval on those teachers who, in plain and vigorous terms, expose their fallacies; and Mr. Jackman did not find the way of promotion any easier because he agitated, in season and out, for the abolition of the vexatious corporal punishment restrictions of the London School Board, and led the resistance against the famous "Circular" that smelt so intolerantly of inquisition. But the sterling and transparent honesty of the man shone through all his actions, and his appointment as head-master of the Michael Faraday School equally redounded to the credit of the School Board that selected him and the teacher who was installed.

A leader of proved ability, a financier of remarkable acumen, a fearless champion of teachers' rights, Mr. Jackman is also a schoolmaster of very eminent ability and repute. He commenced work as head-master in a "slum" school, and carried on a missionary and humanising work with rare enthusiasm and success. In Conan Doyle's phrase, Mr. Jackman's school was a "lighthouse to civilisation," an inspiring object lesson to all who believe that education means elevation—elevation of body, soul, and mind.

In his "slippered ease" Mr. Jackman is the very antithesis of the fighting man. Indeed, I can recall no one so placidly sociable, so pleasantly tolerant, so unaffectedly hospitable. Those who know him best have the highest opinion of his integrity and judgment. His advice is sought and followed in many cases of public and private difficulty, and one often hears the admonition, "When in doubt—ask Jackman."

The N.U.T. may, indeed, be congratulated on its new President. The grass will not grow under his feet during his tenure of the presidential chair. In his mind, the motto of the great organisation over which he will shortly preside should be not only Defence, but Defiance, in the best interests of the cause which he has so warmly at heart. Mr. Jackman has summed up his policy in words which it would be presumptuous in me to paraphrase, and with them I may aptly conclude this attempt at an admiring appreciation:—

"No Politics and no particular Creed at Russell Square. The Child before the System, and Education before the Denomination. Next to the Child and Education I place the Teacher."

THE YORK PRESIDENT OF 1875.

MR. JOHN HARWOOD DEVONSHIRE,

Father of the Teachers' Orphanage.

A QUARTER of a century has passed since the N.U.T. held its last conference at York, and the minds of those whose memories can carry them so far back will naturally revert to that occasion and to him who presided over its deliberations. It seems, therefore, a most fitting occasion for presenting our readers with a portrait of Mr. Devonshire, the President of the York Conference in 1875, and for giving, for the sake of the younger members of the profession, a brief sketch of his career and work.

Born in 1835, Mr. Devonshire became a pupil teacher in the Limehouse Wesleyan School, whence he proceeded as assistant-master to the practising schools connected with the Westminster Training College. Having gained a first-class Queen's Scholarship, he entered the college as a student; and on the completion of a most successful course, was appointed head-master of the Mintern Street Wesleyan Schools—a post he still fills with undiminished ability and success. No elementary school in the country has earned a higher reputation for educational efficiency, and it is to Mr. Devonshire's fidelity and example that many successful teachers up and down the country owe their inspiration. Since 1857 he has laboured in the same building; kept his school in the forefront despite the formidable rivalry of the establishments of the London School Board, with their modern buildings, efficient staffs, and elaborate accessories; trained his own pupil teachers so well that many of them have been at or near the top of the Queen's Scholarship lists; and to-day he teaches with the freshness and enthusiasm of a youth fresh from college. He thus deservedly holds a most honoured place among his professional brethren, and is enshrined in the hearts of hundreds of successful men holding responsible positions in all parts of the world.

But the present occasion calls more particularly for some notice of his public labours in the interests of the teaching profession.

Mr. Devonshire was one of the small band who first instituted and organised the National Union of Elementary Teachers, as it was then called. He was the first treasurer of its funds, and acted in this capacity until, in 1875, he was appointed president. From the first Mr. Devonshire laboured most assiduously to secure the public recognition of the teaching profession; and it was during his presidency that the authorities at South Kensington placed the Museum premises at the disposal of the Executive for the holding of a conversazione. This was honoured by the presence of many leading educationists and high officials of the Council Office; and in the report of that year the Executive recorded their thanks to Mr. and Mrs. Devonshire for the grace and dignity with which they conducted the public reception.

It is, however, as the prime mover in the establishment of the charitable funds of the N.U.T. that Mr. Devonshire is best known and most deservedly revered. A few days before the Liverpool Conference, news of the death of Mr. Selden, the president-elect, reached the Executive, who called upon Mr. Devonshire to deliver the presidential address. Among the rough notes left by Mr. Selden was a scrap of paper, on which was written the single word "Orphanage." The suggestion took root, and in his address to the Liverpool Conference, Mr. Devonshire produced a deep impression by his stirring advocacy of a teachers' orphanage. The scheme met with formidable opposition. There were many then, as now, who conscientiously objected to orphanages, while others felt that the interests of already-existing charitable institutions for teachers would be prejudicially affected. However, for several years, with unflagging zeal, Mr. Devonshire worked away, until, at the Plymouth Conference, the formation of an Orphanage Fund and of a Benevolent Fund was decided on, and Mr. Devonshire was elected treasurer to the Orphanage Fund, which in the first year of its existence amounted to £200. From that year Mr. Devonshire lavished his time and his distinguished abilities on the organisation and development of the fund, and to-day the fruit of his labours and of those of his coadjutors is seen in the magnificent orphanages for the destitute children of teachers who through premature death have been unable to provide for their offspring. The Girls' Orphanage at Sheffield, formerly the mansion of Mr. Mark Firth, M.P., was purchased for £6,000, while the magnificent premises of the Boys' Orphanage at Sydenham cost £10,000. At the present moment seventy-two children are being provided for in the orphanages, one hundred and fifty-four are being supported in their own homes by yearly allowances of £13, while last year fifty-six special grants were made. In all, seven hundred children have directly been benefited by these funds, at a total outlay of over £50,000.

The indirect effects of the benevolent funds have been very great; for nothing perhaps has so conduced to the success of the annual conferences, or given such facilities for engaging the interest of influential persons in the localities in which the conferences have been held, as the functions connected with the promotion of these funds.

It was not to be expected that perfect unanimity should exist as to the administration of these charities. Many have contended that their management should be vested in officers, in whose election every member of the Union, whether a subscriber or not, should have a vote. Against this proposal Mr. Devonshire has persistently and successfully contended, maintaining that, until every member of the Union is a subscriber to the funds, their administration should rest with the subscribers. No ungenerous policy has, however, actuated the subscribers; for though only one member in four of the Union subscribes to these charities, nevertheless the children

of every elementary teacher, even though not a member of the Union, are eligible for election to the Orphanage and orphan allowances.

We now come to an incident which it pains us to record. The recollection of the events which preceded last Conference is still fresh in all minds. It was but natural that some indignation should be manifested, and that somebody should be the scapegoat for the alleged laxity. When the Orphanage meeting connected with the Conference was held, the election of officers was taken near the commencement; and when the result was announced, it was found that Mr. Devonshire had ceased to be treasurer—a result absolutely impossible had he had an opportunity of addressing the meeting prior to the vote being taken. To a large number of subscribers this result caused consternation and grief, and very many hastened to communicate to Mr. Devonshire their profound regret that the treasurership had passed from his faithful and able charge. He had fulfilled to the letter the duties of treasurer as defined in the rules for the regulation of the Orphanage funds, and there was not one iota of justification for complaint against him. This removal of Mr. Devonshire from the office which for over twenty years he

MR. JOHN HARWOOD DEVONSHIRE.

had so nobly and devotedly filled almost tempts one to say with the great dramatist,—

> "Blow, blow, thou winter wind,
> Thou art not so unkind
> As man's ingratitude.
> Though thou the waters warp,
> Thy sting is not so sharp
> As benefits forgot."

But are they forgotten? Will they ever be forgotten? The regrettable incident referred to was the result of a most unfortunate accumulation of circumstances, and did not represent the real feelings of teachers towards their old and honoured friend. Long as the Teachers' Orphanage lasts, the children of those who have fallen in the battle of life, and the teachers who see therein a possible provision for their offspring in the event of premature death, will bless him who has for so many years made huge sacrifices in their behalf.

Those who know him best, who have witnessed his statesmanlike demeanour, his keen sense of humour, his admirable temper in debate, and his unfailing devotion to the welfare of his brethren, will be perfectly certain that the last person in the world to harbour resentment would be Mr. Devonshire.

We are expressing the sentiments of all teachers when we wish Mr. Devonshire many years of usefulness and happiness, and the gratification of witnessing the continued prosperity of those institutions in which, from their inception, he has taken such intense interest as to gain for himself the honourable and affectionate epithet, "Father of the Orphanage."

YORK.

I. THE ANCIENT CITY OF YORK.

> "Lincoln was, London is, and York shall be
> The fairest city of the three."—*Old Prophecy.*

YORK, Jorvick, Eurewic, Eoferwic, Eboracum, Caer-Ebrauc—such is the history of the city, read backward in its names, each stamped with the impress of its own period. In the far-distant days of pre-historic Britain, at the time when David ruled in Israel, Ebrauc, a great-great-grandson of Brutus of Troy, founded a city in the north, and named it after himself—*Caer-Ebrauc*. So we glean from the romantic traditions of Geoffrey of Monmouth, who laid the foundation of many a story now enriching our language in prose and poem. But it is not history. The Romans, however, found here a place whose name they speedily Latinised into *Eboracum*, used in civic records for centuries after they left, and even now retained by the archbishop, who signs himself "W. D., Ebor."

Eoferwic takes us back to the time of the Saxons, whose "upper or capital" city it became. For *Eurewic*—or *Euerwic*, as described in Domesday Book—two derivations have been advanced, both extremely interesting. *Eure* is considered by some to refer to the days when York, situated as it was in the angle between two rivers, and surrounded for miles by the extensive forest of Galtres, was looked upon as a refuge from the wild animals (*ever*, or *eber*, a wild boar). Or, when the Ure, one of the first feeders of the Ouse, gave its name to the whole stream, the city on its banks was *Eurewic*. Easy it was for the Danes to corrupt it to *Jorvick*, and as natural for it to become in later years *York*.

The city which the Romans took possession of became their headquarters when pushing their conquests into the north.

> "This city first by Roman hand was formed,
> With lofty towers and high-built walls adorned,
> To give their leaders a secure repose,
> Honour to the empire, terror to their foes."

Alcuin, the famous scholar and teacher at York in the eighth century, left us many a clue to the history of his native city, and the above is a rhyming translation of some of his lines.

Agricola, one of the earliest and most vigorous conquerors of the Britons, returning from his victorious campaign against the Caledonians, is supposed to have erected here a fortress. His legion, the ninth or Spanish, whose exploits are so graphically described by Tacitus, Agricola's son-in-law and biographer, was for a long time associated with the sixth—*legio sexta victrix*—in camp at York. The Emperor Hadrian brought with him the latter when, in 120, his presence was deemed necessary to subdue the fierce, irrepressible Caledonians. Again, in 208, their raids brought over another emperor, Severus, who came from Gaul, drove them back, and repaired the rampart of Hadrian. He established his court at York, where he died, and was burned on a magnificent pyre erected on a hill, still bearing his name, to the west of the city. It is believed that under Severus, York attained its palmiest days; certainly they were of the Roman occupation. Indeed, it was described as *Roma altera*. The site of his palace in the city is still pointed out, and numerous relics of Roman occupation have been unearthed. The church which now stands there is yet called Holy Trinity of *King's Court*.

Constantius Chlorus, when he was made emperor in 305, came to York to secure his position in the west. His wife, Helena, was a British princess, who, tradition says, discovered the true Cross. Dying at York, he was succeeded by his son, Constantine the Great, the august founder of Constantinople, who was reluctantly induced to assume the imperial purple.

In one of the windows of the Guildhall his election is beautifully represented in stained glass. After a stay of six years Constantine left Britain, and York was the scene of many a quarrel for the possession here of the nominal title of emperor.

The Museum at York has a collection of Roman remains probably unequalled anywhere in England. Inscribed altars and tombs, coins and trinkets, stone coffins and cinerary urns, pottery and tesselated pavements, have been found during excavations, and are jealously guarded by the York Philosophical Society. Besides containing the Museum, the grounds of this society hold the most important Roman relic *in situ* which the city possesses. This is the multangular tower, which stood at the north-west angle of the city wall. Its has been observed that its masonry bears a marked resemblance to that of Hadrian's Wall.

In 410 the Romans were finally withdrawn from Britain, and York, though well fortified and its people well trained, was soon at the mercy of its old enemies, the Picts and Scots. The Romans no longer responded to the appeals of the Britons for help; the latter therefore sought and obtained the assistance of Saxon Hengist. He drove the invaders out of the city; but when he had set the Britons free, he was loth to go away. They therefore killed him. Motives of revenge, however, brought to Britain such numbers of his countrymen that then began the invasion which ultimately lost to the Briton his native land, and made him seek shelter in the wilds of Wales, and other parts where his impetuous quondam ally could scarcely follow him.

It was during this period that mythical King Arthur, who won over the invaders twelve pitched battles, kept the first Christian Christmas at York. But these days are verily the darkest in the city's story: what glimpses authentic history affords are of siege and disaster.

The Anglo-Saxons became masters of Northern England, or Northumbria, and made York their capital. Edwin, one of its kings, was made Bretwalda. Under the influence of Bertha, his wife, and her confessor, Paulinus, he embraced Christianity, and was baptised on Easter Day, 627. For his baptism a church of wood was hastily improvised, and he subsequently commenced the erection of one of stone, which, however, he did not live to complete. No trace of this building is left, though it was finished by his successor, Oswald. Yet it occupies the proud position of being the first of many cathedrals which have stood on the site of the Minster.

When the Danes—"the black storm from the North"—invaded England, they made York their headquarters. It had been besieged and taken by them with horrible cruelty. One of the streets of the city, Goodramgate, is named after a Danish officer, Guthrum. But Athelstan came upon them, and they were defeated at Brunanburgh, along with a multitude of their Scotch, Irish, and Welsh allies. When he returned to York, Athelstan ordered the castle, which the Danes had probably erected on a mound now surmounted by the ruins of Clifford's Tower, to be razed to the ground.

Undaunted by defeat, the Danes renewed the conflict, and in the reign of the Unready, Sweyn and Canute were in turn rulers of the north. York under them was an important city, containing, says one record, 30,000 adults. With Saxon rule again restored, Siward became one of the most famous earls of Northumbria. His daughter was married to "gracious Duncan," the victim of Macbeth, and the old warrior was chosen by Edward the Confessor to destroy the usurper.

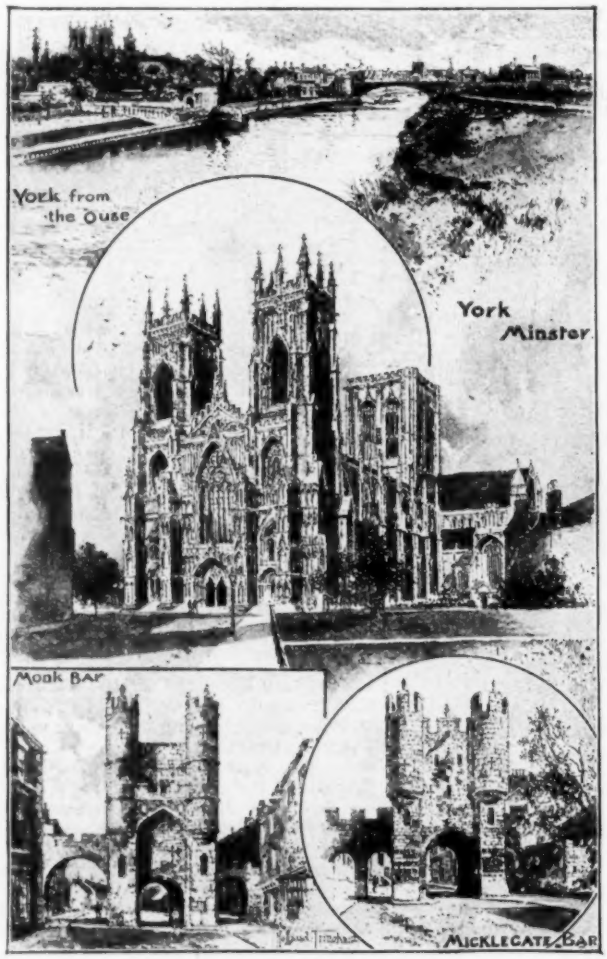
"Gracious England hath
Lent us good Siward and ten thousand men;
An older and a better soldier none
That Christendom gives out."
Macbeth.

The following year he died at York, and was buried in the church of St. Olave, which he had built.

Tostig, the next earl, was driven out by the people; but enlisting the help of Hardrada of Norway, he soon returned. After a battle at Fulford, a mile below the city, they captured York, and even women and children were not spared in the ensuing massacre. Harold, his brother, was quickly upon the scene. He wanted to forgive Tostig, but would promise nothing to the Norwegian but "seven feet of English earth." Tostig preferred to stand by his ally, and in the battle of Stamford Bridge, eight miles east of the city, both were slain. From the triumph feast at York in honour of this victory Harold was called southward, to meet his doom at the hands of the victorious Norman.

No part of England gave the Conqueror more trouble than did York. When he first subdued the city, he repaired the fort destroyed by Athelstan, and erected another on Baile Hill, at the opposite side of the city. But urged on by Waltheof, last of the Saxon earls, the inhabitants attacked and took both these, the garrisons being put to death. William swore "by God's splendour" that he would leave none in the city alive, and though he met with most stubborn resistance, he well fulfilled his threat. In Domesday Book miles of land round *Euerwic* are marked "waste," fire and sword being mercilessly used in his work of revenge. The five lions of the city arms are said to represent the five gallant Saxons who so manfully defended York against William.

Clifford's Tower, now enclosed within the walls of the Castle, was the scene of a terrible massacre of Jews during the persecution waged against them in the reign of Richard the Crusader. They took refuge in this tower, the same which William had restored; but despairing of escape, they first destroyed the valuables which they had brought hither



"THE 'WHITE ROSE' CITY."

for safety, then they killed each other, preferring thus to die than to submit themselves to the mercy of their persecutors without.

Henry of Winchester paid several visits to York. At one of these, his sister, Joan Makepeace, was married to the King of Scotland; and at a later, the Minster was again the scene of a royal wedding—that of Henry's daughter to Alexander the Third.

The Scottish wars of the first three Edwards caused these kings to spend a considerable time in the city. The English Justinian transferred to York the courts of Exchequer and King's Bench, and when contemplating his invasion of Scotland, called here "the fullest and greatest parliament ever held in England." In those days York re-assumed some of the metropolitan dignity and splendour which it had lost since Roman occupation: the nave of the Minster still testifies, by the number of coats-of-arms adorning its windows and walls, to the munificent assistance towards its erection then given by noblemen who thronged the court.

But Edward the Second seemed doomed to disaster. After routing the king at Bannockburn, the Scots overran the north of England, and met at Myton-on-Swale an army raised by Archbishop Melton, but with a result strangely dissimilar to that achieved by another army, also raised by an archbishop, which a century before fought and won at Northallerton the celebrated Battle of the Standard. Now the Scots raided and burned even to the walls of the city.

Another royal marriage, this time of the king himself, Edward the Third, took place in the cathedral. His bride was Philippa of Hainault, and though the attendant festivities were as regal as on previous occasions, they were marred by a conflict which broke out betwixt the English soldiers and the Hainaulters, when above five hundred of the latter and nearly two hundred and fifty English lost their lives. This reign saw a great many parliaments held in the city.

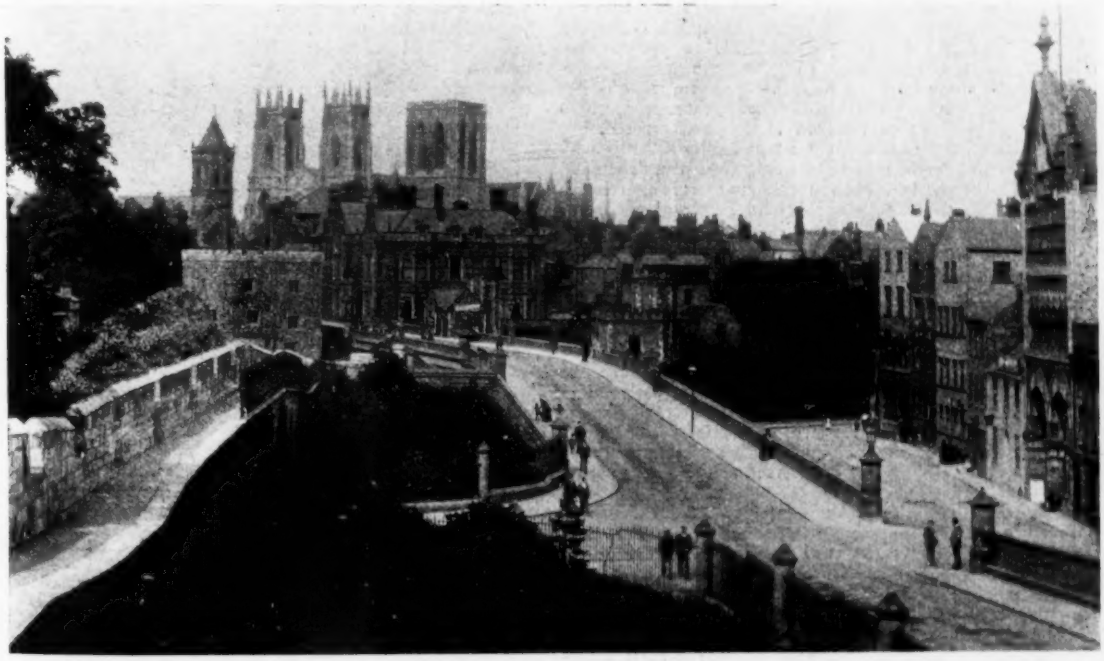
The grandson of Edward the Third, Richard the Second, on one of his visits presented to the then mayor his own sword, and granted with it the title of Lord Mayor. On another occasion he gave to the city a mace, and a cap of maintenance for the sword-bearer. These are cherished among the city's treasures, and are exhibited with no small pride at civic functions.

At the beginning of the Wars of the Roses, York was at first strongly Lancastrian. Henry the Sixth and Margaret were in the city when the battle of Wakefield Green was fought, and the queen ordered the head of the vanquished Richard of York to be crowned with paper and impaled on Micklegate Bar.

"Off with his head and set it on York gates;
So York may overlook the town of York."—*Henry VI.*

The following year, on Palm Sunday, the sanguinary battle at Towton, about eight miles west of the city, brought disaster to the Lancastrians; Henry and Margaret had barely time to escape before Edward and his friends entered York. But the fortunes of war made Edward in turn a fugitive. His subsequent return to his city of York is the subject of a stained-glass window in the Guildhall.

Nowhere more than at York was the effect of the dissolution of monasteries seen and felt. It is still "a city of churches," but the anti-Romish zeal of Henry the Eighth caused the destruction of its nine monasteries, its sixteen hospitals, and eighteen out of its forty-one churches. Robert Aske, the leader of the Pilgrimage of Grace, came with his multitude of followers to York; he seized the king's treasure, and invited all who had been turned out of the religious houses to return. He was, however, taken prisoner, and as a warning to other malcontents his head was hung, as was then customary, from one of the towers of the city.



YORK FROM THE CITY WALLS.

Henry's reply to this outbreak was the establishment of the Council of the North, an afterwards infamous president being Thomas Wentworth, Earl of Strafford. Of course, under the rule of this council the liberties of the city were considerably curtailed.

York during the Civil War was a favourite residence of Charles "the Martyr." He lived some time in the King's Manor House, now the Wilberforce School for the blind. In 1644 was fought at Marston Moor one of the battles most decisive against the cause of the king. Prince Rupert had raised the siege of York, but, with his usual rashness, dashed off to attack the approaching Ironsides.

"On Marston heath
Met, front to front, the ranks of death.....

See page 545 for York Conference Programme.

On either side loud clamours ring,
'God and the Cause!'—'God and the king!'"

Rokeby.

A year or two later, and in the city Charles loved so well, the Scots received £200,000, their pay for the help they gave the Parliamentarians against him.

York was no favourite of Charles the Second, and he soon found cause to deprive it of its charter, which was not regained till after the Revolution. Then with the cry of "A free parliament, the Protestant religion, and no popery!" Danby seized the city for the Oranger. Thus ended its days of stress and strife; the sounds of war were no more heard within its walls. And though fire and sword, plague and famine had so often been the lot of the city, still, when at the beginning of last century Defoe visited it, he described it as "a pleasant and a beautiful city. The beauty of peace is to be seen in its ruined fortifications."

II. THE MINSTER.

"The most august of temples, the noble Minster of York."

Among the treasured remains of olden days, and they are not a few—ruins of abbey, keep, and hospital, Guildhall, churches, and city walls—the cathedral is pre-eminent. Whether the church of Edwin (627) was the first is uncertain. Of the stone building he commenced no trace is left save the well from which tradition says water was drawn for his baptism. Another Saxon church was erected, but often neglected and repaired, till it was finally destroyed by a fire which the garrison had started to clear away some old houses near the castle. The foundations of this church can still be seen in the crypt—rubble and herring-bone walls. The horn of Ulphus, one of the earliest to endow the Minster, is still kept among cathedral antiquities.

The Normans built another church, but fire swept this away, and it was rebuilt by Stephen. It finally disappeared to make way for the present building, yet some of its broken columns and zigzag mouldings are left among the Saxon remains in the crypt.

The entire history of English cathedral architecture can be traced in the present edifice, which has been justly called the finest Gothic building in the world. Its transepts are Early English. The first, the south, was built by Archbishop Grey, whose tomb it contains, about 1250. Monuments to Dean Duncombe, by Boehm, and Archbishop Thomson, by Thorneycroft, are also here.

The north transept shows later architecture, leafage and dog-tooth ornamentation being more marked. Dickens, in *Nicholas Nickleby*, refers to the celebrated lancet window, the Five Sisters, which this transept contains. The designs of its richly-stained glass were said to have been first worked in tapestry by five sisters.

The present nave was next erected, the small Norman one being taken down. This fourteenth-century portion, Decorated in style, and beginning at the transepts, shows a gradual advance from Geometrical to Florid, culminating in the resplendent Flamboyant window of the west front. This disputes with one at Carlisle the title of being the finest of its kind in England. The west end of the nave is surmounted by two Perpendicular towers which belong to the fifteenth century. Some of the sculpture here, especially that round the central door representing the story of Adam and Eve, is remarkably beautiful.

The Ladye Chapel, at the opposite end of the cathedral, was next added. Its early Perpendicular east window, though not quite so large as one at Gloucester, which is the largest in the world, is considered superior in that it retains its original stained glass. The Choir, between the chapel and the transepts, is of later Perpendicular, and took the place of the Norman. It contains a beautiful reredos, and some splendid carving in the stalls, pulpit, and archbishop's throne. Between the choir and nave is the richly-ornamented Rood Screen, on the top of which stands the great organ. It has fifteen niches, which contain life-sized effigies of kings from William the First to Henry the Sixth. The central or lantern tower was finished just before the western ones. From the commencement of the transepts to the completion of the towers was an interval of nearly two hundred and fifty years.

The Chapter House adjoining the Minster is a most magnificent building. Like the nave, it is Decorated, but is much finer. Its form is octagonal, and its roof differs from those of some chapter houses in being unsupported by a central column. Its windows are filled with old and beautiful stained glass, and the canopies of the stalls which run round the building are adorned with very delicate but quaint sculpture.

Inscribed on the walls of the chapter house is a Latin couplet which can well be applied to the whole cathedral,—

"Ut Rosa flos florum,
Sic est Domus ista Domorum."

The Minster library, lying on the north side of it between the Deanery and the Residence of the canons, contains some valuable old manuscripts, among which are a copy of Wickliffe's New Testament with Queen Elizabeth's signature, copies of the Vulgate of the times of Henry the Third and Edward the First, and some of Caxton's early work.

Near the east of the Minster is St. William's College, now let in tenements, but formerly accommodating the many priests who did duty in the chantries of the cathedral. Though dedicated to St. Peter, the patron saint of the cathedral was St. William of York, hence the name of the college. It has an old-fashioned courtyard, over the entrance to which is a weather-beaten image of St. William.

III. OTHER OBJECTS OF INTEREST.

The City Walls are, after the Minster, the most distinctive feature of old York. They extend, with but short breaks, for nearly three miles round the ancient portion of the city. The oldest part is the Roman multangular tower, and in other places the foundations are supposed to be Roman. The present walls apparently belong to the time of Edward the First, and were strengthened by Edward the Third's orders. They are built on the top of a mound, varying in height up to thirty or forty feet. At the angles of the walls, and at various points between, are towers or bastions, and the walls themselves are throughout their entire length either battlemented or provided with arrow slits. A pathway about four feet wide is on the inside, and affords a most pleasant walk round the city.

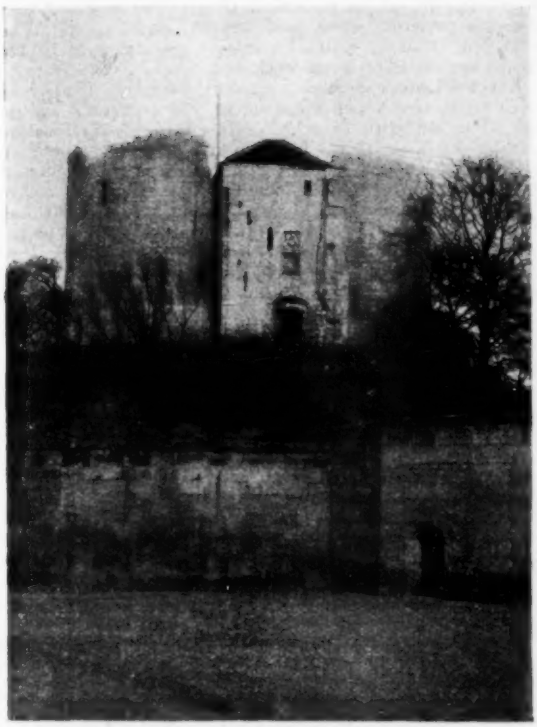
The gates or entrances to the city are called "Bars." Each consists of an arch above which are embattled towers. Formerly they were further protected by barbicans, but only one of these is left—at Walmgate Bar. Here can be seen still in position the massive oaken doors and portcullis. Above these, partly supported on pillars, is a house of the time of Elizabeth. The most imposing entrance to the city is Micklegate Bar, whose arch is supposed to be Roman work. The turrets are surmounted by stone figures of warders, and were often disfigured by the heads of fallen foes.

Monk Bar, built in the fourteenth century, is the loftiest of the four. Its name was changed from Goodramgate Bar in honour of the hero of the Restoration. On the top of its corbelled embattled turrets huge figures stand with stones ready to throw on foes beneath. At Bootham Bar, the smallest of the four, there is drawn up into the chamber above the old portcullis. The side arches of all the Bars are modern.

Besides the Roman multangular tower, the grounds of the Philosophical Society contain the ruins of St. Mary's Abbey and St. Leonard's Hospital. The abbey was founded in 1087 by monks from Whitby, on land given them with the church of St. Olave by Earl Siward. It became one of the most powerful Benedictine monasteries in England, and had one of the few "mitred" abbots who had also a seat in Parliament. When it fell at the Dissolution, its stone was used to repair the adjoining church, the castle, and even Beverley Minster.

The old gate of the abbey still stands; and the Hospitium, where were entertained those who were not able to enter the abbey, now contains, besides Roman remains, relics of Saxon, Norman, and mediaeval times.

The museum is built on part of the site of the abbey, on a spot occupied by the short-lived palace of Henry the Eighth.



CLIFFORD'S TOWER.

The collections of fossils and bones from Kirkdale caves are very interesting, and there are good specimens of Ichthyosaurus and Plesiosaurus.

St. Leonard's Hospital was founded by Athelstan in 936, for the benefit of the Culdees, a body attached to the Minster, who looked after sick and poor. Endowments given by Norman kings enabled it to become in time one of the wealthiest in the land. Though not in any way connected with the abbey, it fell at the same time. Henry had most probably a channel in view into which he could divert its wealth. Among the ruins are deposited some Roman coffins which have been unearthed in or near York.

The Mansion House, in Coney Street, is the official residence of the Lord Mayor. It was built in 1726, from designs of the great architect the Earl of Burlington. It has a magnificent state-room, in which many civic functions are held. The large portraits around are mostly of past lord mayors or city members of Parliament. At the Mansion House is kept the city's plate, which makes a valuable collection. It has been presented at various times. Among the chief pieces may be mentioned the official gold chains of Lord Mayor and Lady Mayoress, a loving-cup of gold, six large silver tankards, and massive silver gilt cup, all of the seventeenth century.

Behind the Mansion House is the Guildhall. It is a Gothic structure, Perpendicular in style, and built in 1446. It was originally the hall of the guilds of St. Christopher and St. George; but when these were dissolved, it was given to the commonalty of the city, and is therefore sometimes called "the Common Hall." The pillars which support the roof are each the trunk of a single oak. The windows, already referred to, have now nearly all been filled with stained glass depicting some striking scenes in the history of York. The first of the series shows the election of Constantine the Great as emperor, in 306; the last, the meeting at York, in 1850, of the mayors of England, when the Prince Consort was present. This meeting is of great interest, as it was held preliminary to the Great Exhibition of 1851.

The old muskets round the hall belonged to the "York Blues," a body of volunteers raised in the city to repel the expected attack of the Young Pretender in 1745.

In the muniment room at the Guildhall are kept city charters and records, the oldest being of 1155, and containing reference to an earlier one, which has not, however, been found.

The Castle, in Tower Street, whose present high walls are modern, contains the Assize Courts, prison, and Clifford's Tower. The castle and tower were formerly surrounded by moats drawn from the Foss, which flanks one side. The tower, now in ruins, was blown up by, most probably, a wilful explosion in 1683, and was never repaired.

York has a number of old churches, a never-failing source of interest to visitors who have time to see them. The lantern-tower of All Saints, Pavement, is a striking object; in Walmgate are two churches, St. Dennis's and St. Margaret's, each with richly-ornamented porches; the stained glass of Holy Trinity, Goodramgate, shows, among other subjects, a most quaint representation of the Trinity; another has the birth-register of Guy Fawkes; and at another "curfew bell" is still rung every evening at eight.

The Merchants' Hall, in Fossgate, and St. Anthony's Hall, on Peaseholme Green, are two halls still remaining of the trade guilds of the Middle Ages. The latter is now used for the Blue Coat School, whilst in the Merchants' Hall occasional meetings are held. Under it is a dark, cold chapel, reached through a trap-door in the floor of the great hall.

A few of the old streets of the city are left, and frequently one comes across old houses of wood and plaster, with projecting upper stories, flanked by others of modern brick and mortar. The Shambles and Stonegate are the most typical examples of the streets of old York. It is interesting to notice that most of the old thoroughfares are called "gates"—Micklegate, the big street; Spurriergate, the street of the spur-makers; Goodramgate, already mentioned; Stonegate, the way along which the stone was taken from the river at the building of the Minster, being then the widest approach to it; Walmgate, the way to the *vallum*, or wall; and Jubbergate, formerly *Jew-burg-gate*, a street mostly occupied by Jews who lived in the city in mediæval times.

RUINS OF ST. MARY'S ABBEY.

IV. SOME EDUCATIONAL INSTITUTIONS.

The Royal School of St. Peter of York, as its arms designate it, is situated at Clifton, one of the suburbs of the city. It is a first-grade public school, having classical and modern sides, and preparing boys for the universities, the army, the medical and legal professions, and for commercial life.

The school buildings and master's residence are in Perpendicular style, and the chapel adjoining is Decorated. Recently, by the anonymous gift of an "old Peterite," a capital gymnasium has been erected. The school is the ancient grammar school of the Cathedral, and, as such, was under the rule of the dean and chapter; but now it is administered by a body of governors elected under a scheme made by the Charity Commissioners in accordance with the Endowed Schools Act. The dean is a governor *ex officio*, and the others are appointed—four by the dean and chapter, two by the archbishop, one each by the councils of the city, the three Ridings, and the Yorkshire College.

The present head-master is the Rev. G. T. Handford, formerly assistant-master at Dulwich and Uppingham; and a past head was Canon Elywn of Charterhouse. The school has eight foundation and several smaller scholarships, three exhibitions of £50, and has the privilege of competing for the Lady Hastings (£90), tenable at Queen's, Oxford, and the Ackroyd and Watson (£50) Scholarships, tenable at Oxford or Cambridge.

Among some of the "old boys" since 1849 may be mentioned Dr. Browne, Bishop of Bristol; Dr. Cammidge, Bishop of Bathurst, Australia; Dr. Robinson, Master of St. Catherine's, Cambridge; T. Clifford Allbutt, Regius Professor of Physics, Cambridge; J. F. Leaf, Fellow of Peterhouse, newly appointed H.M. Inspector of Schools; and in York, a past Lord Mayor, Ed. Gray, and the present Recorder, W. A. Meek, late Fellow of Trinity. To the world of sport it has given Frank Mitchell, captain of Cambridge Rugby and cricket teams, and of England *v.* Scotland, besides many others in university and county cricket and football; H. W. Rhodes; J. H. G. and W. G. Wilson; Eyre, in the Cambridge boat in '84; and Davis, cox of the "dead-heat" year.

The history of the school is of more than a thousand years—indeed, it lays claim to being the oldest in England. Founded in the eighth century, it first stood on ground now occupied by the nave of the Minster. Alcuin, the friend and teacher of Charlemagne, was one of its earliest and most distinguished heads. It had then a university fame, and the library connected with it and the Cathedral was one of the most valuable in Europe. When its site was needed for the extension of the Minster, it was conducted in the house of one of the canons.

Philip and Mary endowed the school with the premises and revenues of the Hospital of St. Mary, Gillygate. Afterwards the disused church of St. Andrew was used, and later the building on the south side of the Minster, now occupied by the Church High School for Girls. It was removed to its present picturesque buildings in 1844.

Another old grammar school, but reorganised by the Charity Commissioners, is **Archbishop Holgate's,** founded in 1546. Originally it was in the Minster Close, but in 1858 its present building on Lord Mayor's Walk was erected. It is now an organised science school, having chemical laboratory and workshop, also accommodation for fifty or sixty boarders. Like St. Peter's, it has the privilege of sending competitors for the Ackroyd Scholarship. It is interesting to notice that both these schools claim the notorious Guy Fawkes as an "old boy."

A school which has on its roll of past pupils such names as John and Jacob Bright; Sir Joseph W. Pease, Bart., Chairman North-Eastern Railway Company; J. G. Baker, F.R.S.; Professor Sylvanus Thompson, Professor F. W. Oliver, Dr. Bevan Lean, is well worthy of note. **Bootham School,** belonging to the Society of Friends, was opened in its present premises in 1846, being before then in another part of the city. Besides all the usual school subjects preparatory to university and other examinations, special interest is taken in *leisure* educational work. In the large grounds there are a gymnasium, an astronomical observatory with 4½-inch telescope, sidereal clock and transit instrument, and a workshop fitted up with all necessary appliances, and three lathes, one suited to metal-work.

Natural history is here a favourite study. The school has a capital collection of specimens, and excursions are arranged to study all branches of this subject. Lessons are occasionally given in the museum and grounds of the York Philosophical Society. There is an annual exhibition of all work done "out of school," including natural history collections, diaries of personal observation and research, turning, plain carpentry, etc., from the workshop, drawings, and photographs. The "Old Scholars' Association" supplies the prizes.

A similar institution for girls, **The Mount School,** is also established in the city.

The Church Schools Company and the Girls' Public Day School Company have each a school at York, in the Minster Yard and Fishergate respectively.

A famous institution is **The Yorkshire School for the Blind,** established at York, 1833, in memory of William Wilberforce, the great advocate of the abolition of slavery. Situated close to Bootham Bar, it occupies the King's Manor House, a quaint Jacobean structure, once the residence for several years of the Earl of Strafford. It is on the site and built of material of the old Abbey of St. Mary.

The building was first obtained in 1835, on lease from the Crown, but a school jubilee fund enabled the governors to purchase it in 1885. The chief object of the founders was to so ameliorate the condition of the blind "as to enable them to obtain a livelihood, attention being at the same time paid to their moral and religious training." Instruction, aided since 1895 by Government grants, is given; among the branches are oral lessons in various subjects, reading and writing in Braille, arithmetic, Guldberg pencil-writing, typewriting, and manual instruction, ending in making useful kinds of wood and basket work. Drill and gymnastics receive regular attention in the school's gymnasium, and music forms a special feature of the institution—weekly concerts being given by the pupils.

Branch institutions for assisting former pupils have been established—one at Scarborough for women; another, a workshop for men, at Middlesborough. Another at Whitby, though under independent management, is looked upon as an agency for the sale of York-made goods.

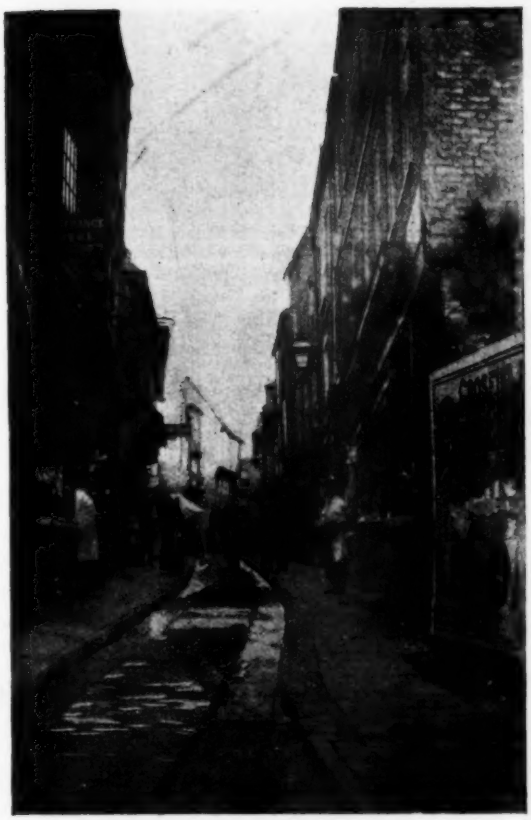
Connected with the school are funds for conducting an outmates' department, by which work is supplied to those who have passed through the school; another, to enable former pupils to establish themselves in positions of independent industry; and a third, an out-pupils' department, for teaching those whose blindness came on too late to allow of their admission to the school.

From the exhibits in the English Education Exhibition recently held in the Imperial Institute, the pamphlets describing the history, education, and training of the school have been selected to be sent to Paris as part of the English Education Exhibition there.

Many visitors to the Easter conferences will doubtless find time to visit one or more of the schools under the York School Board, which have received such high praise from all kinds of authorities and from all parts of the world. They have been cited as models of arrangement and equipment by educational authorities, and have consequently been visited by deputations from School Boards and others interested in elementary education.

They are built on the central hall and class-room principle, and are ventilated by air, specially heated and filtered when necessary, and forced throughout the whole of the building by means of a steam fan. The largest accommodate above 1,400 children, have workshops and cookery departments attached; and the newest, at Scarcroft, has also a chemical laboratory.

The York Diocesan Training College for schoolmasters, situated in Lord Mayor's Walk, was founded by the Diocesan Society in 1846. It has accommodation for seventy-six students, and this number is soon to be increased. Quite recently twelve new bedrooms and three bathrooms have been added, as well as a physical laboratory. In addition to preparation for the usual examinations of the Education



THE SHAMBLES.

Department, special attention is now to be given to London University work. The college has adjoining it its own private chapel. The lectern, reading-desk, and pulpit were presented by the Old Students' Association, in memory of the first three principals—the Revs. G. C. Hodgkinson, Canon Robinson, and G. Rowe. The college magazine, *The White Rose*, is issued monthly, excepting holiday times. The college motto is "Floreat Ebor." A new model school, costing about £2,300, and to accommodate 210 boys, is approaching completion, and will be equipped with latest appliances for both model and practising school purposes. The present school-rooms are to be adapted for the use of the college.

Towards these improvements more than £2,000 has already been contributed by the Diocese of York, and between £3,000 and £4,000 has been promised from those of Ripon and Wakefield.

In connection with the forthcoming Conference, a reunion of old students will take place at the college on Easter Monday, and to a certain number of those who may be representatives the college committee offer free board and lodging during the week.

Next Month:

OUR ILLUSTRATED CONFERENCE NUMBER.

Contributions by Special Correspondents.

The Training College for Mistresess at Ripon, in connection with the Ripon and Wakefield dioceses, was opened in 1862, being transferred from York. The college stands in its own fields, of ten or eleven acres, on the outskirts of the city. It has tennis courts, a cricket pitch, and a hockey ground. Within the past two years there have been added to the college a chapel, science room, laboratory, and extra accommodation in common and class rooms as well as bedrooms—now making total provision for 100 students.

The students of the first year use the college practising schools, but in the second year they visit Church and Board schools in Leeds—an entirely new departure, that of boarding and lodging the students for three weeks for practice in a distant school centre. Arrangements are also made for visiting schools of various kinds, both urban and rural, in the district.

The Ripon College Association of Old Students publishes yearly a capital magazine; prominent on the cover is the college motto, "Nisi Dominus frustra."

The Yorkshire College, Leeds, is one of the constituent colleges of the Victoria University. Besides the subjects ordinarily dealt with in university colleges, arrangements are made and classes held for higher instruction in subjects specially applicable to a large commercial centre, including coal-mining, engineering, dyeing, and textile and leather industries.

Connected with the college are numerous scholarships and exhibitions.

The Leeds Day Training College is established as a department of the Yorkshire College. Twenty men and twenty-five women Queen's scholars may be chosen for admission, and are allowed to reside at their own homes, if within a reasonable distance, or may live in lodgings specially registered by the college authorities. In this department Professor Welton is Professor of Education and Master of Method, and Miss J. A. Emmerson the Mistress of Method.

The University College of Sheffield is established under a scheme by which the endowments of the Firth College, the Sheffield Technical School, and the Sheffield School of Medicine were consolidated. It provides instruction in all branches of learning necessary to qualify for degrees at any university in the United Kingdom; and also provides such scientific, medical, and technical instruction as may be of immediate service in professional and commercial life. As in the similar institution at Leeds, special attention is given to those subjects which are required in a district essentially commercial; and there is also a Day Training College for teachers in connection with it.

THE OLD MANOR HOUSE.

Our Monthly Retrospect

EDUCATION IN ENGLAND.

N.U.T. NOTES, ETC.

BY T. B. ELLERY, F.R.G.S.,

President of the National Union of Teachers, 1895–96.

Assurance of Annuity Premiums: Superannuation Act. One of the most important pieces of work done by the Executive during the past year was the establishment of schemes for the assurance of annuity premiums under the Superannuation Act of 1898. It has always been admitted that the great defect in the Government system of superannuation is that none of the premiums paid to the Annuity Fund are returnable. Under the existing financial arrangements, no provision for the return of these premiums could possibly be made. Nothing but a complete rearrangement would allow this to be done. Either the teachers' contributions must be increased, or the amount of pension at 65 must be reduced; and as neither alternative would be satisfactory, and as the Treasury will not budge, at any rate for the present, it was necessary that the N.U.T. itself should take up the work, and endeavour to remedy the defect. It was recognised that a teacher might pay into the fund for years and die before the pension age was reached. In that case the whole of the premiums would be entirely lost, so far as that teacher is concerned.

A teacher of, say, 21 begins to pay at 21, and continues paying until he is about 63 or 64 years of age. He then dies. He has paid in all about £126. Not one penny comes to his relatives. This consideration led the Executive of the Union, in consultation with the Teachers' Provident Society, to devise schemes whereby this hardship would be reduced to a minimum. Two schemes have been prepared, and these are now submitted to the members of the Union. In order that there may be no mistake, a few notes as to each are given here.

Scheme A, Assurance Scheme. The principle of this scheme is really that of a life assurance, increasing in amount year by year at a given rate. A certain payment is made yearly by the teacher under Table VIII. (Teachers' Provident Society), and each payment ensures the return of £3 in the case of men, £2 in the case of women, *plus* the amount of premium paid to the society should death occur before age 65 is reached.

If, therefore, a teacher paid for five years and then died, his relatives would receive £15 (£3 × 5), *plus* the amounts paid to the Teachers' Provident Society in the way of assurance. Some examples are given in the society's prospectus, and these may usefully be quoted. A teacher joins at 21 and pays 20 years' premiums. He then dies, and the amounts due would be:—

	Men.	*Women.*
For benefit,	£3 × 20 = £60	£2 × 20 = £40
For premium,	£1 × 20 = 20	14s. × 20 = 14
Total paid at death,	£80	£54

—these being the respective amounts that the teacher would have contributed (*a*) to the Government Annuity Fund, and (*b*) to the Teachers' Provident Society. In this case, therefore, *no loss whatever will have been sustained.*

Let another illustration be given. A teacher joins at 35 and pays for 25 years. On death then occurring, the amounts payable would be:—

	Men.	*Women.*
For benefit,	£3 × 25 = £75 0	£2 × 25 = £50 0
For premium,	19s. × 25 = 23 15	13s. × 25 = 16 5
Total paid at death,	£98 15	£66 5

In connection with this scheme there are three important points which must not be lost sight of:—

1. There are large *surrender values* should the teacher leave the profession before age 50 is reached, the society guaranteeing the return of 80 per cent. of the premiums paid under Table VIII.

2. Nothing is payable after 65. This must be distinctly understood. At 65 all contributions and all benefits cease. But although nothing is payable from this source, it must be remembered that the teacher at 65 enters upon his superannuation allowance from the State.

3. There is no medical examination, a general declaration of good health from the applicant being accepted as sufficient.

Scheme B, Assurance Scheme. Scheme A is an assurance in the event of death before age 65 is reached; under Scheme B, a member may assure the return of the total amount paid to the Government in the event of death before age 65 is reached, *or on the attainment of age 65.* Of course, with this double provision, the premiums are higher. As illustrations the society gives the following:—A teacher joining at 21 (next birthday), and living to 65, would contribute to the Government £3 × 44 = £132. By a payment of 4s. 2d. per month the teacher may assure that the whole of this £132 is payable at 65, or at any time previously should death have occurred. In a similar manner, a teacher joining at age 35 (next birthday) would pay £90 to the Government. For 4s. 11d. per month he may provide that this £90 is payable at 65, or at death should that occur previously.

"By this means the member is not only covering the risk of loss of income in consequence of an early death, but at the same time, and with the same payment, he is providing a sum of money at 65 which will be found useful to him in his declining years." Under Scheme B there are several advantages, amongst which are—1. A teacher may assure any other amount up to a maximum of £200; 2. The benefit may become payable at 50, 55, or 60, instead of 65. A medical examination is necessary, but for assurances of not less than £50 the society bears the expense.

It will be seen from the foregoing that the most complete arrangements have been made to suit almost every individual case, and it will be strange indeed, therefore, if a very large number of teachers do not join immediately. Already an excellent start has been made. Readers of this journal, as well as other members of the Union, have a double duty before them—if they have not already taken the necessary steps. They have to "accept" the Act (the last day of grace is the 31st of March), and they should at once join the assurance scheme, which has been here explained in full. Prospectuses may be obtained from the General Secretary, 71 Russell Square, W.C.

A Proposed Lending Library. A would-be critic said recently, "The Executive is composed of a number of men and women, all of whom have schemes more or less impracticable." It may fairly be claimed, however, for this much-abused body, that many educational reforms which have been accomplished are due to its initiative—reforms which unquestionably owe their origin to "schemes" threshed out in committee and afterwards adopted by the Executive. A

Next Month:

JUBILEE OF NORTH LONDON COLL. SCHOOL FOR GIRLS.

Interview with Mrs. Sophie Bryant, D.Sc. (Lond.).

domestic proposal—"scheme" if you will—of some importance is that of a lending library for the members of the Union. The details are not quite settled yet, but there is every prospect of the plan being carried out. That being so, members, especially those in rural districts, will have exceptional opportunities for obtaining the best books on the lowest possible terms. In connection with this, the latest Executive movement, the name of Mr. R. R. C. Gregory, chairman of the Rural Schools Committee, should be mentioned. He has drawn up an excellent report upon the whole subject, and given particulars which will be of great service to the committee charged with the duty of management. The lending library will be another item to add to the already lengthy list of "tangible benefits" conferred upon members of the National Union of Teachers.

Some Conference Arrangements. For some years the railway companies made little or no concession to members of the N.U.T. travelling to the Conference town. Last year, however, they agreed to issue return tickets at single fares and a quarter—an arrangement which holds good this year. A letter has also been received stating that return tickets will be issued at York to places within a radius of fifty miles at single fares. Teachers making their Conference arrangements should be careful to note these points. The political clubs will extend their courtesy and hospitality to all representatives—a privilege of which members will not be slow to avail themselves. Some of the "stalwarts" will regret to hear there is to be a "Conference Dinner," which is looked upon by many as a waste of money and a waste of time. The majority of the older and more experienced representatives, however, know the value of such a gathering, and are convinced that so far as money is concerned, it is a good investment; and as to time—well, opinions will always differ as to what constitutes a useful and enjoyable evening. An unfortunate arrangement has been made with respect to the College Reunions, which will be held on the Monday, the first day of the Conference.

It seems almost impossible to obtain any reliable information as to the number likely to be present at each of these gatherings, and that being so, how can the York caterers manage with satisfaction to themselves and those for whom at the eleventh hour they may be called upon to provide? Undoubtedly the best possible has been done, having in view the week's engagements; but Monday is a most unfortunate selection. It is understood, too, that the annual meetings of the Funds will be held on that evening, as well as the annual meeting of the Provident Society.

Salaries of Mistresses of Infants' Schools. It may be remembered that at the Conference of Infants' School Mistresses held in March 1898, the following resolution was adopted:—

"That, seeing that the cost and time occupied in securing the efficient training of an infants' school teacher are identical with those required for the training of a teacher of a girls' school, this Conference is of opinion that the scale of salaries for teachers in infants' schools should be identical with that adopted in girls' schools in the same district."

Those who have watched the progress of affairs in this matter have noticed that the number of School Boards making no distinction between the two classes of schools in respect of salaries is steadily increasing, and this is as it should be. Will any one say that the skill, experience, and labour requisite for the management of infants' departments are less than those required for the management of girls' departments, or that the work is less responsible and less difficult?

Infants' school teachers, before applying for appointment under particular Boards, should be careful to inquire as to the salaries paid in the girls' and infants' departments. A return furnished to the Executive at its last meeting gives the following:—

"Some of the School Boards which make no distinction in salary between the two classes of teachers are: Aberdare, Barking, Bexley, Birmingham, Bolton, Bradford, Bristol, Cardiff, Carlisle, Cromer, Croydon, Darlaston, Dartford, Derby, Devonport, Dewsbury, Edmonton, Enfield, Erith, Folkestone, Hartlepool, Hastings, Hinckley, Holyhead, Hornsey, Horsham, Hucknall Torkard, Ilford, Ledbury, Leyton, Manchester, Newcastle, Nottingham, Otley, Plymouth, Pontypridd, Rotherham, Sevenoaks, Sheerness, Sheffield, Southampton, Southend, South Shields, Stoke-on-Trent, Stokesley, Swindon, Tynemouth, Wakefield, Walthamstow, West Ham, and Workington."

This information should be of considerable service to those lady teachers who are readers of THE PRACTICAL TEACHER.

Opinions as to Circular 439. This circular, entitled "Age of Exemption from School Attendance," was dealt with in our Notes last month, and the paragraph ended as follows: "What will our rural friends say to all this? It would be interesting to have the opinions of such representative men as Mr. R. R. C. Gregory and Mr. F. B. Gale." The former gentleman writes as follows:—"The Robson Clause, relating to the employment of children in the agricultural districts, seems to me a most ugly blot upon the Half-Time Act of 1899. It practically establishes as a principle the absurd fallacy that the education of the peasant children is not a matter of so much importance as the education of those of the urban centres. It sacrifices the educational opportunities, and that during the best years of their school life, of the lads who have the misfortune to be born in a village, to the demands of those who hunger for the employment of child labour. That is the tragic part of the business. The comic element is introduced by the Education Department when they issue their rules as to the school attendance of these rural half-timers. Was anything ever so delightfully simple? How many attendance authorities in the agricultural districts are going to carry out those rules? They will only chuckle, and go on as they have been going on in the past, and rejoice in the power of being able to evade and ignore the very rules they are expected to carry out."

Mr. F. B. Gale of East Dereham writes thus:—"I hope that there will be no general adoption of the agricultural amendment to the Act of 1899.

"It is very questionable whether even the adoption of the clause will give agriculturists generally any increase in the amount of boy labour at their disposal.

"It is only in districts where potato-raising, fruit-picking, hop-picking, and similar industries are carried on that there is any excess of demand over supply in boy labour. At least this is my experience, and I am sure that of many other rural teachers. I always have a number of lads on my books, sons of labourers, who are qualified to go to work, but whose parents prefer to keep them at school. Parents, it is true, too often have no high conception of the value of education; but, on the other hand, they are by no means keen on supplying the farmer with cheap child labour.

"The parents remember their youthful days, when they had to rise with the dawn and go out into the fields 'scaring crows' till the shades of night fell. The days spent in this occupation seldom afford matter for pleasant reflection in after years.

"The labourer, too, notwithstanding his real and seeming density of understanding, cannot but admit that the fruits of child labour are more profitable to the master than to the man; but whatever be the reason, there is no general desire on the part of agricultural labourers to send their children early to the fields. And I know for a fact that men have been glad to use as an excuse the Education Acts, when their masters have wanted to employ their boys.

"The Robson Clause will, I feel sure—except in the cases before referred to—when adopted, prove by no means a blessing either to parents or employers, or to those school authorities who adopt it."

Higher-Grade Schools. Those interested in the higher-grade school movement are doing well in placing before the general public facts and figures bearing upon the work of these schools, their growth and success, the recent policy of the Education Department, and the need of Government support and encouragement.

It is clear that for many years the policy of the Education Department and of the Science and Art Department was to assent to the erection of higher-grade primary schools, and to foster the development of schools of science in connection therewith. For the last two or three years, however, the Departments have apparently adopted quite another attitude. Some School Boards, indeed, have found themselves in the position of having built and equipped schools for purposes

hitherto approved by the Departments mentioned, only to have their recognition refused and the Government grant withheld. From the evidence at hand, one is led to believe there must be something in the charge that the policy of the Science and Art Department seems to be to permit schools of science to exist in connection with endowed schools alone. If this is true, then the policy is doomed to failure. It may be that some teachers in endowed schools are jealous of the progress being made by these higher-grade primary schools; it may be there is some foolish fear of extending and improving the education of the masses. But whatever the reason may be, the hostility to the schools under consideration will lead to no permanent injury; for as soon as the ratepayers realise the true position of affairs, the danger will be over. It is just as well, therefore, that members of Parliament should be put in possession of all the facts of the case, and that locally the hands of School Boards should be strengthened in every possible way. The committee of the masters of higher-grade schools and the Executive of the N.U.T. are working together in this matter, and with every prospect of ultimate success.

Grateful Hearts. Reference has been made in these columns, on several occasions, to the attitude of those teachers who, when Superannuation was in the air, and certain proposals were being discussed, strongly advised the Executive to close with the offers made. Those very proposals were embodied in an Act and passed into law. From that moment the good people referred to talked of "paltry provision," criticised the Executive for permitting such an Act to pass, and said and did many things of which perhaps the less said now the better. In contradistinction to all that is the following letter, received at Russell Square (a sample of many, by the way): "You and the Executive deserve our warmest thanks for the persistent and determined efforts put forth to secure pensions for teachers. It must be a gratification to you that at last success has crowned your efforts." In this case both husband and wife are now receiving pensions, the former's amounting to £47, 16s. 3d., and the latter's to £35, 14s.—a total of £83, 10s. 3d. There is, of course, room for improvement; every one admits that. Still, to attack the Executive is not the way to succeed. Let all the teachers in the country join the Union, let all who are eligible "accept" the Act, and there will then be a prospect of success.

By the way, no teacher will be allowed to "accept" after March 31.

"Something for the Old Guard." Under this heading in the February number a reference was made to an old teacher whose years of service spent in a school not in receipt of Government grants had been accepted by the Education Department as recorded service. Unfortunately, this is not in connection with the Superannuation Act of 1898, but with Article 130 of the Code. The effect in this particular case will probably be that the teacher's pension will be increased by £10. "The Old Guard" will be glad to hear that the Executive has been able thus early in the year to carry out its pledge on behalf of the pre-'62 teachers, a deputation being received at the Education Department by Sir George Kekewich on Friday, March 9. The writer of these notes, as chairman of the Superannuation Committee, had the pleasure of "stating the case" on behalf of these old servants of the State, and he was followed, and ably supported, by his colleagues. The deputation consisted of Messrs. Yoxall, M.P.; Gray, M.P.; Clancy, M.A. (president N.U.T.); Jackman (vice-president), Wild, B.A., and Waddington (ex-presidents), G. J. Rankilor (former president), Ellery (chairman Superannuation Committee), Coward (vice-chairman), and W. G. Humphries, one of the Old Guard. The gathering was a private one, consequently nothing further can be said at the present moment. But it is safe to say a good case was made out.

Dr. J. G. Kerr. All readers of THE PRACTICAL TEACHER will unite in congratulating Mr. John G. Kerr, M.A., former President of the Educational Institute of Scotland, upon the distinction of LL.D., which has just been conferred upon him. The present writer has known Dr. Kerr for years, and has worked with him in the cause of Superannuation and in other professional matters, and it is, therefore, with no little pleasure that he offers the heartiest congratulations to the man whom the University has delighted to honour. Dr. Kerr is a man of great ability and sound judgment, and one whom to know is to respect and admire. Long life, health, and prosperity to him!

EDUCATION IN SCOTLAND.

E.I.S. NOTES, ETC.

BY JAMES PATERSON,

Ex-Vice-President of the Educational Institute of Scotland.

Nature-Knowledge. NATURE-KNOWLEDGE being a new Code subject, teachers everywhere are seeking for information as to its meaning and methods. The Incorporated Institute of Scottish Teachers of Agriculture, recognising the importance of the subject, has instituted classes in Edinburgh for the instruction of teachers, and the inaugural address was delivered by Professor Wallace, of the chair of Agriculture. The professor pointed out that the new educational creation, nature-knowledge, had been christened in Germany, had been taught with considerable success in the United States, and was now beginning to be understood and welcomed in this country. The name was, he thought, admirably appropriate, as it left it open to those interested in the work to shape a course suited to local conditions. After touching on several points of interest to teachers, he said the subject of agriculture, when properly defined, and when its teaching had been established on judicious lines, would be one of the most popular of the group of nature-knowledge subjects found suitable for rural districts.

Professor Thomson on Nature-Study. In an address to the members of the Aberdeen Branch of the E.I.S., Professor J. A. Thomson, Aberdeen University, advocated the study of natural history by specimens and direct contact, visits to museums, and season excursions, in preference to instruction from text-books.

Edinburgh Branch, E.I.S. At the usual monthly meeting of the Edinburgh Branch of the Institute, Mr. J. G. Goodchild, of the Geological Survey, delivered a lecture, entitled "Walks about Edinburgh with a Geologist." The lecturer took the audience with him round the most interesting parts of the Queen's Park, Calton Hill, and the Castle, and in a racy and interesting manner gave numerous hints and suggestions to those who might take pupils with them in geological excursions. Particularly he referred to the reading of the past in the present nature of the stones, and advised teachers not to allow their pupils to mutilate any rare or characteristic exposure by taking away specimens. They should think of others coming after them, and simply look at stones and pass on. The lecture was illustrated by limelight views.

Training College for Dundee. The Scotch Education Department has approved of the teaching arrangements for the new Dundee Training College for Teachers. Mr. James Brebner, rector of the Harris Academy, and Miss Porter, Harris Academy, have been appointed respectively master and mistress of method, and it is expected that twenty male and twenty female Queen's students will be recognised.

Memorials in Public Schools. The Lord Advocate was asked the other evening in the House of Commons whether his attention had been drawn to the encouragement promised by the Committee of Council to the managers of public elementary schools in England to adopt the proposal to inscribe upon their walls the names and record of old scholars who had distinguished themselves by acts of heroism and self-sacrifice, or had earned in other ways a high place in their country's regard; and whether the Scotch Education Department would adopt the same course towards schools in Scotland. The Lord Advocate replied that the Department was in full sympathy with the suggestion referred to in the question, and would gladly see it adopted where the school authorities thought it expedient.

Superannuation. The Glasgow School Board has agreed to give assistant mistresses who have reached the age of fifty-five the option of retiring at this time on an allowance fixed in proportion to their salary.

The late Mr. Allan, Aberdeen. The death of another well-known leader in the Educational Institute falls to be recorded—that of Mr. James Allan, who retired only a few weeks ago from the head-mastership of the Rosemount Public School, Aberdeen. Mr. Allan had for many years taken an active interest in the work of the Institute. He was twice chairman of the local branch, served a term as vice-president, and was long a member of the general committee of management.

Fifeshire Branch, S.A.T.A. The annual meeting of the Fifeshire Branch of the Scottish Assistant Teachers' Association took place lately in Kirkcaldy. In delivering his retiring address, the president, Mr. Thomas Melville, referred to three subjects—superannuation, tenure of office, and the new Code. Speaking of superannuation, he was of opinion that the Institute's best policy, and that most likely to be successful, was to aim at an increased pension for all, without respect to salary or position. With reference to tenure of office, he thought the right of appeal a natural corollary of a compulsory Superannuation Act. The latest Code he regarded as a credit to its framers, who have produced a worthy ideal of a national education.

Ayrshire Branch, E.I.S. The last quarterly meeting of the Ayrshire Branch of the E.I.S., held in Kilmarnock, was the largest that has been held for years. There was an exhibition of hand-and-eye work, which included specimens of paper-folding, mat-weaving, basket-work, designing in coloured papers, crayon-work, cardboard-work, brush-drawing, and wood-work. There were also classes at work at the various occupations. Mr. David Yuille gave an address on "Manual Occupations in Schools," in which he discussed the relative value of the various occupations, giving to brush-drawing the place of honour as a manual exercise.

Mr. J. G. Kerr, LL.D. In the list of Glasgow University honorary degrees will be found the name of Mr. John G. Kerr, M.A., head-master of Allan Glen's School, Glasgow, and a former president of the Educational Institute of Scotland. Dr. Kerr for a number of years took a leading part in the work of the Institute, and the Superannuation Act of last year is largely due to his able and persistent efforts.

Advanced Departments. It may be of interest to teachers preparing a scheme of instruction for an advanced department to know that less than three hours weekly will not be considered adequate for instruction in a language.

Cardboard Modelling. A meeting of the Dalkeith Branch of the Educational Institute was held the other Saturday, to hear a paper by Mr. David Graham, superintendent of manual instruction to the Edinburgh School Board, on educational handwork. Mr. Graham, in treating of cardboard modelling as a means of education, said that all such exercises, no matter what kind of material was used, were intended to provide opportunities of training the eye to accuracy and rapidity in observation, the hand to skill in manipulation, and the mind to a sense of the importance of truthfulness in work.

A "PASS" IN PRACTICAL PLANE AND SOLID GEOMETRY.

☞ **See specially contributed article (with many Illustrations) to**

THE PRACTICAL TEACHER'S ART MONTHLY for April.

Price Twopence. Order from your Bookseller.

NOTES FROM THE NORTH.

The Presidentship of the Institute. Owing to the operation of the new rules passed at the September meeting, the members of the Educational Institute of Scotland will have the privilege and duty of voting during April for the President of the Institute for the coming year. Formerly the voting extended from May to August, but this year the voting will be finished by 30th April. As this is the transition year, there will also be voting during the same month for the vice-president and the members of the General Committee. There will be now one vice-president, elected by the whole of the members of the Institute, instead of six vice-presidents, one for each province. The members of committee, too, will be elected by voting papers and by a provincial vote, whereas in former years they were selected at a district meeting by open vote.

MR. A. C. MACKENZIE.

The last day for nominations for all these positions has been fixed for the 31st of March, but by some oversight no provision was made for candidates withdrawing. This, however, the Special Committee at their last meeting rectified, so that now three days will be given for that purpose.

It may be of interest to members of the Institute and to others if we give a short account of the candidates who are seeking the suffrages of the Institute. There are three candidates—one hailing from the far North, one from the Midlands, and one from the Borders.

Mr. A. C. Mackenzie, F.E.I.S., J.P., head-master of Maryburgh School, who is the nominee of the Northern Counties' Association, is a native of Ross-shire. Educated at Kintail Free Church School, he was trained at Glasgow Free Church College during the years 1861–62. The whole of his professional career has been spent in Maryburgh. In 1863 he was appointed to the Free Church school there, which in 1873 was transferred to the School Board.

Mr. Mackenzie has since early in the sixties been closely identified with the teachers' organisations. He assisted in founding the Ross-shire Schoolmasters' Association in 1865, and is, we believe, the only member surviving. This association was merged in the Institute in 1874; and of the new body he acted as first secretary—a position he held for many years. He is at present treasurer of the local branch.

MR. A. MENZIES.

His active interest in the General Committee of Management of the Institute dates from 1886. Since that year he has continued to represent the members of the Ross-shire Association. For ten years he has been a member of the Executive or Special Committee, and for nine years a member of the Board of Examiners. He was elected one of the vice-presidents in 1893. As showing the keen, active interest he has always manifested in Institute matters, it may be mentioned that

he has only once been absent from the General Committee meetings since 1886.

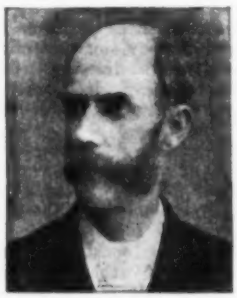
Mr. Mackenzie has taken a very deep interest in local affairs, and was made a Justice of the Peace in 1894. His energies, too, have found scope in the volunteer movement, which he joined in 1865. He was appointed a commissioned officer in 1868, and in 1871 he passed through the military school at Aldershot. He is in command of the local company, with the rank of Hon. Major.

His keen interest in the educational and professional welfare of the Highlands and Islands of Scotland is well known, and his election to the highest position the Institute can bestow would be but a fitting reward for his untiring devotion to its interests. His knowledge of all educational questions is wide and varied, his zeal is undoubted, and his enthusiasm unwearied.

Mr. Alexander Menzies, F.E.I.S., J.P., rector of the Webster Seminary, Kirriemuir, is the nominee of the Dundee Branch of the Institute. He is a native of Perthshire, where he received his early education. He afterwards attended the High School of Dundee, at which institution he began his professional career. His first appointment was at Tealing, near Dundee. In 1873 he received his present head-mastership.

During the whole of his career, Mr. Menzies has shown great interest in the welfare of the Institute. He has been three times president of the Dundee Branch, and a member of its committee for a number of years.

For four years he was a member of the General Committee, though he is not so at present.



MR. J. M'KENZIE.

Mr. Menzies is a man of wide and varied scholarship, and is a linguist of some note. To acquire a thorough knowledge of French and German, he was wont to spend his summer holidays abroad.

There can be little doubt that in him the presidentship of the Institute would be worthily maintained, both from his ripe knowledge of educational questions, and from his extensive experiences of the various problems facing the profession.

In Mr. George Rae, F.E.I.S., we have an old parochial teacher of the best type. His connection with the affairs of the Institute has been very long and varied.

As one of the founders of the Dumfries Branch, he has or many years been associated with its work. He has been a member of the General Committee of Management of the Institute for more than twenty years.

As showing his wide interests in education, it may be mentioned that he has held the position of president of the Scottish School Book Association, the Parochial Schoolmasters' Widows' Fund, and the Parochial Schoolmasters' Association.

Mr. Rae has been frequently a member of the Special Committee, and at one time held the position of one of the vice-presidents of the Institute.

Than Mr. Rae, schoolmaster of Wamphray, no one on the General Committee during our acquaintance with that body has shown a shrewder grasp of educational problems. His common sense and eminent business qualities have made him one of the most trusted members of the committee, and by him the duties of presidentship of the Institute would be discharged with great ability and success.

Of the candidates for the vice-presidency, we can only say that their number is increasing. The following have been nominated: — Mr. J. M'Kenzie, Holburn Street Public School, Aberdeen; Mr. G. Lowson, High School, Stirling; Mr. Jas. Beattie, High School, Oban; Mr. Jas. Matthew, Public School, Corstorphine; and Mr. S. M. Murray, Sciennes Public School, Edinburgh. While it is not safe to predict who will be elected, it may be said that any one of the candidates would be well able to maintain the traditions of Scottish education. Some of these, we understand, are likely yet to withdraw, so that the contest will probably be carried on by three. It may be stated that the rules of the Institute do not allow for the one election of vice-president carrying with it the presidentship next year.

The New Code.

The Code of 1899, doubtless owing to the fact that its provisions have not as yet been sufficiently tested, has been subjected to very few changes in 1900. The changes are all of a minor character, and may very briefly be noted. The question of registration is to a very limited extent simplified by the fact that transferences of ages require to be made only once a year—that is, the attendances of a child who becomes seven or ten during the first part of the school year are to be registered as if the child were over seven or ten all the year; but to compensate for this generosity, the attendances of a child who reaches seven or ten during the latter part of the school (financial) year are to be reckoned as under seven or ten all the year.

MR. G. LOWSON.

The only method of simplifying registration that will satisfy is the "block grant," and it is to be hoped that this year will see its introduction. The number of registers required in some schools, if reports are to be trusted, must be a matter of great encouragement to the Scottish publishing firms, but to the head teachers of these schools a source of considerable annoyance.

The recent circular of Lord Balfour on Physical Training in Schools finds, in some of its terms, a place in the new Code. As pointed out in the circular, grants would be made to depend on the amount and quality of physical exercise. This, in the Code, reads that the normal grant may be increased by 6d. on account of meritorious work. In recommending this grant, the inspector is to be guided by the fact that the arrangements for physical exercise or military drill must be satisfactory.

An important change with regard to the Merit Certificate has also been introduced. A pupil may not now be presented for examination more than once within six months. If some School Boards and inspectors would adopt a like attitude with regard to the examinations for the Labour Certificate, the advantage to the pupil and to education would be great. I am led to believe that in one large town in Scotland Labour Certificate examinations are being held monthly, and that pupils who fail in one are being allowed

MR. J. BEATTIE.

to present themselves at the next. Surely this wholesale method of examination is subversive of the best interests of education in that district. Once in six months is quite sufficient.

MR. S. M. MURRAY.

The year, though destitute of great changes in the Code, has been a very fertile one in the issue of circulars, minutes, forms (new), etc.; and teachers who wish to have these in accessible form, and at the same time possess the most recent notes on the Codes, should avail themselves of the new issue of that splendid publication—the *vade mecum* of Scottish education—Nelson's *Annotated Code*.

FOREIGN NOTES.

BY E. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

THE new Gains of Learning Act, passed by the Legislative Council of the Madras Presidency, is an innovation which threatens the whole fabric of Hindu society. According to the traditional Hindu law, the earnings of each member of the family belong to the family as a whole. The new law provides that where such earnings are made in any of the learned professions, they shall be considered to belong to the individual who earns them. This, to European minds, is obviously equitable. But it is in glaring disagreement with the whole spirit of Hindu family life. "Our pride, our individuality," says a Brahmin High Court vakil in *The Indian Review*, "lies in the love and affection which the members of a household feel for each other. The disruption of family ties and the disintegration of the household must be the inevitable results of this legislation." He calls upon Lord Curzon to veto the Act at the eleventh hour. "A Brahmin Teacher" says:—"This law strikes at the root of the joint family system, and inculcates calculation from the very beginning. The Hindu family as it is at present will very soon be a matter of the past, and the consequence will in time be another problem for solution, something like the labour problem of Europe, which naturally follows the sharp division of a people into a small moneyed class and a large proletariat.

* * * * * *

Commenting on the resolution of the Indian Government recommending students proceeding to England from India to obtain certificates of identity, an Indian journal remarks:—"We welcome the resolution for various reasons. Indian princes and chiefs have pined away in England without any relief for which they went there. The last Newab Nazim of Bengal, Behar, and Orissa was over-run by a cart, and a Chumba prince died like a dog in the streets of London. The resolution is perhaps the first official recognition of the Secretary of State's responsibility for minor Indians resident in England. Though the India Office has always kept an eye on those Indians, watching their careers, particularly in regard to their political views and movements, there has never been any systematic method of keeping an official record of their names and antecedents. The departure will no doubt prove of immense value to young Indian students in England. Apart from the fact that the Secretary of State will be looked up to as the last resort in the extreme case of destitution, the mere official record will impress them with the idea that they are in touch with the India Office, and that their careers are being cautiously watched, thereby exercising some sort of moral influence upon young men away from their homes, free and irresponsible, and absolutely without control."

* * * * * *

Le Volume has unearthed a curious entry concerning the duties of a French teacher of one hundred years ago, from the records of a rural *mairie*. It is as follows:—"This day, October 27, 1790, before us the mayor and municipal officers, assembled in the church, it having been pointed out that the place of schoolmaster was vacant, M. le Curé believed he could not do better than present to the parish as schoolmaster the Sieur Jean François Jolly, schoolmaster of Beaulieu. The matter having been deliberated upon, the inhabitants with one voice agreed to recognise the said Jolly as schoolmaster, so long as he would satisfy the inhabitants and abide by the conditions hereinafter explained." The conditions were manifold. He was "to assist the *curé* in everything, and prepare everything necessary for the divine service." School was to be kept from the 1st of October to the end of July, from 5 a.m. to 6 p.m. School fees were 5d. per month in winter, and 2½d. per month in summer. There was also a fee of 8d. for assisting at the sacraments and winding up the clock, "on condition that the teacher shall furnish the grease and the cords for said clock."

* * * * * *

One reason for the lack of efficiency in French elementary schools may lie in the fact that there are too many holidays. There are sixty-four of them in midsummer, three at All Saints, ten at Christmas and New Year, two at Saint Charlemagne, two preceding Lent, fifteen at Easter, three at Whitsuntide, and three at the National Festival in July. To these must be added the fifty-two Sundays and certain public occasions, amounting to at least ten days, such as the burial of celebrated men and the election of a President. So we have two hundred and twenty-six holidays as against one hundred and thirty-nine school days. It is quite possible that there may be compensating advantages for the pupils. There are certainly such for the teachers, who will be glad to be relieved at frequent intervals from the iron routine of the over-centralised French school system. Still, while the proportion of illiterates among French recruits is as high as it is, the efficiency of the French system must be acknowledged to be greatly inferior to that of Germany.

* * * * * *

Until we have more detailed returns of the distribution of French illiterates, it is impossible to say whether their prevalence is due to a faulty educational system or to the linguistic heterogeneity of the French Republic. A century after the great Revolution, France is not very much nearer to the uniformity then dreamt of. In the *Preussische Jahrbücher*, Professor Heinrich Zimmer, the great Celtologist, throws a glaring light on the anomaly of education which modern Brittany represents. With over half a million Bretons who do not speak a word of French, the national schools are garrisoned by teachers who do not speak Breton, who are prohibited from using the vernacular for teaching French, and who inflict degrading punishment upon children caught in the act of speaking a word of their mother tongue. No wonder the young men turned out by such a system are "illiterate," though they may both read and write Breton. Now that a similarly barbarous system is on the point of being removed in the west of Ireland, it is to be hoped that an up-to-date bilingual system will be adopted in Brittany also.

* * * * * *

One matter in which French schools are decidedly ahead of their European rivals is that of school decoration, which the present Minister of Education is believed specially to have at heart. In sending a number of coloured pictures representing French landscapes and monuments of national

art to the national schools throughout the country, he wrote:—"By this innovation I wish to show the interest which I take in the decoration of our schools. They are not only to be well appointed and in good condition, but are also to cultivate the sentiments of order and cleanliness, and promote a gay and happy disposition.....The views of the different parts of France are to give a concrete form to the idea of the fatherland which must govern and inspire the whole teaching.....Shortly I shall send a series of portraits of the men who have wrought by word and deed for the progress and greatness of our country." The transformation of the school into a "second home" has gone so far in some districts that concerts and even balls are officially instituted there.

* * * * * *

The *Deutsche Blätter* publishes a series of articles on "The Cultivation of the Monarchical Sentiment in the School." There is something almost fantastic in the title and the contrast which it presents to the "cultivation of republican sentiment" in the schools of France and the United States. Yet the attempt to foster the sense of allegiance to existing institutions is less ludicrous in Germany than it is in France, where the form of government has been changed five or six times in the course of this century. Germany is largely the creation of its crowned heads, and the veneration for the monarch as the individually responsible guardian of the nation's destinies is probably greater in Prussia than in any other European state outside Russia. The king not only reigns, but he governs as well. He is not infallible, but, as the author says with reference to the school, "educational tact demands the same care and consideration in criticism of the dynasty as is required in civil life, where the faults and shortcomings of the parents are not made known to the children, and only spoken of with the greatest delicacy when it is unavoidable."

* * * * * *

A Buenos Ayres correspondent of the *Rinnovamento Scolastico* warns Italian readers against undue elation at the recent recognition of the Italian language in the Argentine Republic, and the granting of public money for its teaching. The grant only amounts to the endowment of a chair of Italian at the National College of Buenos Ayres, and another at Rosario. Italian is placed far below English and French, since it is only an optional subject; whereas English and French are compulsory in all the national colleges of the Republic. The editor adds: "How easily we burst out in enthusiasm! It is probably true that we are the most easily satisfied people in Europe. In the schools of the Argentine the Italian language should be compulsory and not optional, as Italians form a large proportion of its population." If the Argentine Republic is to provide for the instruction of all the immigrants in their respective languages, its exchequer will have even less of its accustomed stability, for its population is probably more mixed than any other on earth.

THE COMMON SCHOOLS OF RUSSIA.

II.

BY OUR SPECIAL CORRESPONDENT.

WITH regard to the curriculum, the common schools of Russia are divided into so-called "one class" and "two class" schools. In the larger towns, and especially in both the capitals, there are "three class" schools. In the first, the course extends over three years; in the second, five years; in the third, six, or, in certain cases, seven years. The first three years' work is identical in all the three species of schools, and is arranged as follows:—

Out of a minimum compulsory hours' work per week of twenty-seven, twelve must be devoted to religion, eight to the Russian language, five to arithmetic, and two to writing. The religious subjects are—the learning by heart of church prayers, certain psalms, the exposition of selected portions of Old and New Testament history, the ten commandments, etc. To this six hours per week are devoted. Three hours per week are spent in reading the Church Slavonic, either in portions of the New Testament, or more frequently in lives of saints of the Orthodox Church. The remaining three hours of the twelve are employed in "church singing." All the religious teaching is by word of mouth, and books are used only in the reading of the Church Slavonic, while the teacher must invariably be the local *pop*, or other person in holy orders whose qualifications are such as to satisfy the ecclesiastical authorities of the diocese.

The eight hours per week devoted to the Russian language for three years are not expected to do more than enable the pupil to express simple ideas in a form more or less grammatical, but it is expressly stated that there is no possibility of ensuring correctness of spelling in a three years' course. It should be remarked that the spelling of Russian is infinitely simpler and more regular than that of English, or indeed of other European languages, and that the literary requirements of the common Russian belong to the category of the infinitely small. This being stated, some idea may be formed of the state of mind of the pupil on entering school, and of the enormous difficulties with which the teacher has to contend.

In arithmetic, the requirements of the three years' course are—the first four rules, very simple fractions, and the most common Russian weights and measures. The fractions which enter into the third year's course are only the very simplest, such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{2}$, $\frac{1}{3}$, and addition or subtraction in fractions is confined to the first three of the above examples.

In the "two class" schools the fourth and the fifth year's routine is somewhat enlarged. Religious subjects are reduced to nine hours per week; Russian language, six; arithmetic and elementary geometry, seven; geography, two; Russian history, two; and writing and drawing, three—making twenty-nine hours' work per week.

The normal school age is reckoned at from eight to eleven years old, and during these ages the two sexes work together in the not very large percentage of cases where provision is made at all for the education of girls. Examinations are held at least every year end, and pupils who are unable to pass into the division above after two annual attempts must leave the school. If a pupil "sits" two years in one division, the other two divisions must be passed at the first attempt, or he must make way for others, schoolroom space being far too valuable to be wasted on pupils who are not rather over than under the average level of intelligence. In spite of the large amount of windy talk in certain quarters about the introduction of "universal" education, the schools of Russia are still practically no more than light-givers to the few who are receptive—the difficulties of driving a modicum of knowledge into the dull being rarely honestly faced, since there are many more applicants for places in the schools than can be received, even with all the disregard, so common in Russia, of the laws of health in the matter of overcrowding. Money is wanting, sadly wanting, to enable even those public bodies, such as the majority of the Zemstvos, who are sincerely desirous of improving matters, to do so. And until some five years ago, there was a marked absence of any encouragement in that direction from the Imperial Government.

The teachers in these common schools are paid so poorly, and the demands made on them are so great, that it would not be too much to say that in the majority of cases they must be genuine apostles of pedagogy. The highest salary paid is about £30 in English money, and only some six or seven per cent. of the number obtain that coveted amount. About twenty per cent. receive less than £20 per annum, and the remainder between £20 and £28. This, however, is only for properly qualified teachers with certificates from some of the secondary educational establishments, or even with special training in the art of teaching. Those—and they are not few—who have no certificates to show have to make ends meet on about £15 a year in English money. These amounts, to be sure, have a higher purchasing power in the necessaries of life, as understood in Russia, than would be the case in England; but when it is considered what hardships must be

endured by the educated teacher, settled in the midst of *mujiks*, practically cut off from the outer world, and without the means even of purchasing books or papers, in a country where there are next to no libraries even in considerable towns, it will be understood how great must be the ardour of the men who fill these posts of honour.

The peculiar nomenclature of "one class" and "two class" schools has doubtless puzzled the reader in connection with a course extending over three or five years. I have simply translated the Russian terms, but to be intelligible, it would perhaps be better to call them in English "one teacher" or "two teacher" schools—the fact of the matter being that in the former type one teacher has to keep going three separate divisions in their first, second, and third year of study respectively; while in the other two, teachers have to attend to five divisions. As the religious subjects must be taught by the *pop*, the teacher has some little assistance, certainly; but the amount of it is easily deduced from the routine of hours expended on the various subjects as already given. Thus one teacher will have the care of perhaps as many as ninety or a hundred pupils at a time. The results may be imagined! This arrangement is purely the effect of poverty, or, the same thing from another point of view, the want of proper provision by the Imperial Government. There is nothing in the regulations to prevent schools having a separate teacher for each division, but it is only in a very insignificant minority that any attempt is made to carry out this permissive, but by no means compulsory, arrangement. The happy exceptions are the schools which are paid for by rich corporations—such as the Mill schools, and a few belonging to the Lutheran bodies scattered about Russia.

A RURAL SCHOOL IN RUSSIA.

The discrepancy between the Russian name of "one class," "two class," etc., and the real signification of those names in practice, might be taken as a type of the entire conduct of the schools (and, *par parenthèse*, of many other matters also) in Holy Russia. To the eye and mind of the innocent foreigner, a "one class" or a "two class" school seems a very sufficient sort of educational supply for the infant *mujik*, whose natural attainments are very little above those of the beasts that perish. Similarly, the curriculum marked out for these schools seems simple and sufficient. How does the matter work out in practice? The vast majority of the pupils, ten years after they leave school, remember nothing but the church prayers, and some hazy ideas of church history which formed the bulk of their studies. The ability to sign one's name is, of course, retained, and that is sufficient to entitle the *alumnus* to describe himself in official papers, passport, contract papers, and the like, as "gramotnly," or "literate." The census paper would put such a man down as "literate" although he could neither read nor write as an eight-year-old English boy would understand these terms. The exceptional minority are either those men who would have got learning in spite of all hindrances, or more often the large class of *mujiks* with whom religious fervour takes the place of all other interests in life. The latter finds no lack of books, cheap and easily procured, on which to exercise his talents in the years which follow his brief attendance at school. But the censure—the ordinary censure on all printed matter, the still stricter church censure, the special censure on books allowed to be kept in village libraries (where such exist) or to be sold by book-shops in centres accessible to the *mujik*—and a host of other supposed safeguards, prevent the ex-scholar of the common school whose tastes are secular from finding any food for his mind for the rest of his life. All the reading calculated to raise the mind, to excite the imaginative faculties, accessible to the *mujik*, deals with church matters—lives of the saints and martyrs of the Orthodox Greek faith, the literature of which, both in substance and in extent, is somewhat astonishing. Other reading consists of treatises on farming, and domestic subjects of various kinds—in short, what De Quincey classed as the dead-level cook-book genus—or else short stories of the moral inculcation kind, mostly unredeemed from insipidity by any charms of style or subject at all likely to appeal to the *mujiks*. Consequently, the man who is not conscious of any particular religious fervour is left calling for bread; and getting nothing but the stone represented by the class of book referred to above, he naturally ceases to bother his head with reading, still less with writing; and as he has never anything to count, the arithmetic disappears into oblivion with the other R's. But—the church prayers, psalms, and legends of the saints remain more or less distinct, from the ceaseless iteration of the church's teaching in its services, in its icons everywhere before the eye, and that habit of dragging sacred names into the petty affairs of every day, even to the lying of the market-place,* which marks the formalistic religion of Holy Russia. At the worst, then, it cannot be said that the *mujik* has wasted his three years at the common school, at least from the point of view of the church—the only united, and therefore the most powerful, ruling body in Russia.

(To be continued.)

* The Russian saying on the lips of every tradesman which, as those who have had occasion to deal with him know too well, certainly forms one of his principles of life, runs thus: "If you don't lie, folks won't buy!"

IMPORTANT CONTRIBUTIONS FOR THE

FORTHCOMING MAY EXAMINATIONS

APPEAR IN THE APRIL NUMBER OF

"THE PRACTICAL TEACHERS' ART MONTHLY."

Order from your Bookseller. Price 2d.

OUR CLASS ROOM AIDS

FULL NOTES OF TWO LESSONS.

By WILLIAM DONE, B.A., *Head-Master of Brighton Pupil Teachers' School.*

See Supplement presented with this Number.

I. COPPER.

Articles of Illustration.—The Object Lesson Supplement accompanying the lesson, some pence and halfpence, any articles made of copper, specimens of copper ore, a few crystals of blue vitriol, and some pieces of copper wire.

HEADS.	MATTER AND METHOD.
I. Some of the physical properties of copper. *(a) Red colour.* *(b) Ductility.* *(c) Tenacity.*	Let the class notice first the colour of a piece of pure copper, and by reflecting on the colours of other metals, they may arrive at the conclusion that the quality of *redness* distinguishes it from all these metals. The very common use of copper wire will suggest another property—its *ductility*. Its *tenacity* may also be illustrated by fastening to a piece of copper wire a weight just sufficient to break a piece of tin wire of the same thickness. It ranks next to steel and iron in this respect, and with a diameter of one-fifteenth of an inch will support a weight of two and a half hundredweight.
II. How and where copper may be obtained. *(a) Sources of supply.*	Sometimes we find copper in the earth almost in a pure state, and it is then called *native copper*, and has a crystalline form. Sometimes it occurs as a compound of copper, iron, and sulphur, known by the name of *copper pyrites* or *yellow ore*. Combined with carbon and oxygen, it forms the beautiful *blue* or *green malachite* chiefly found in Russia. Combined with oxygen, the copper ore has a *red colour*, and this kind is principally found in Canada round the shores of Lake Superior, and in Australia. Our great source of supply at home is Cornwall, and copper pyrites is the common form. Devonshire, Anglesey, Isle of Man, Cardiganshire, and Carnarvonshire are other localities from whence the ore is obtained.
(b) The smelting.	A little questioning will elicit that in England the copper ores are not found in close proximity to the great coalfields, as is the case with our iron ores. A study of the map will show that the large coalfield of South Wales is in a more or less central position with regard to the copper mines of England and Wales. The neighbourhood of Swansea is the chief locality of "copper works" in the British Isles. To obtain the pure copper from such an ore as copper pyrites is a lengthy process. We require to get rid of both the sulphur and the iron, not to speak of other impurities. Such ore is usually first broken into somewhat small pieces, and heated to such a point as will cause a good deal of the sulphur to vaporise and pass off as sulphur dioxide. This process is termed roasting. The next operation is to melt the roasted ore. This requires very great heat, which is obtained by means of a blast-furnace such as is seen in the diagram, where the *tuyères* can be noticed leading from the large air tube to the interior of the furnace. The molten metal collects at the bottom, while the refuse or dross, called *slag*, floats at the top. The molten metal is run out into a suitable receptacle. Unfortunately this process does not get rid of the iron and the rest of the sulphur. The compound, now known as *matte*, or *regulus*, or *coarse metal*, is smelted over again, and various substances added, until all the iron and sulphur are either driven off by heat, or run off in combination with the added materials.
III. Alloys of copper.	Show how easily a piece of pure copper may be bent, and compare with the hardness of a penny coin. Such a coin is composed of a mixture of ninety-five parts copper, four parts tin, and one zinc; and the union of these three metals has produced a compound known as *bronze*, which is much harder than either of its constituents. Such mixtures of different metals are termed *alloys*. (The subject of Alloys would form a very good lesson by itself.)
IV. Copper as a conductor of electricity.	Refer to the use of copper as a conductor of electricity. In the diagram we see how it is employed in this respect for electric cables, such as the cable between England and America. The seven conducting wires are in the centre, and in section appear as a star. They are surrounded by gutta-percha for an insulating material, to keep the electricity from escaping into the water or into the earth. The other envelopes are usually composed of hemp and iron wire, with a compound of pitch and sand, all of which serve as a protection, and are known as the *armour* of the cable.
V. Recapitulation.	After recapitulation, if time permits, we might show how easily copper can be obtained from such a solution as blue vitriol. Prepare this solution, and add a drop of sulphuric acid. Dip the blade of a bright pocket-knife into it. In a very short time it will be covered with a deposit of red metallic copper.

II. THE SOIL.

Articles of Illustration.—Specimens of different kinds of soil, such as garden soil, loose sandy soil, stiff clay soil, etc.; specimens of common rocks, as limestone, granite, etc.; an old frying-pan or iron plate, with heating apparatus.

HEADS.	MATTER AND METHOD.
I. What we mean by the term "soil."	Refer to some of the substances before the class, and gather from them such terms as *mould*, *dirt*, *earth*, *soil*, and also the use of this material.
II. Different kinds of soils. *Differences discernible by—* *(a) The eye.*	From the specimens exhibited, and from the children's observation out of doors, differences in soils may be gathered. Some of these are patent to the eye—the dark colour of the garden mould, the red or yellow hue of the sandy soil, the lighter tint of the chalky soil, etc. Differences may also be felt when one walks upon the ground. The heavy clay which clings to the boots, the

Heads.	Matter and Method.
	loose earth under the short grass on hills, making the turf so springy, may be exemplified. By handling the specimens we may find out still more. The clayey soil may be moulded with the fingers, and may be contrasted with dry, loose earth, which runs through the fingers when a handful of it is taken.
(*b*) *The hand.*	Again, by rubbing between the fingers, some soils appear gritty, some almost soapy.
III. Different soils are suited to different kinds of plants.	By questioning, we could gather from country children that in certain particular districts special kinds of crops are grown, and hence infer that certain kinds of soils are best suited to certain kinds of plants.
IV. General composition of soil.	Weigh out a pound of damp garden mould. Heat it strongly. We notice the smoke arising, and also that it emits a more or less powerful smell. When the soil has ceased smoking, weigh it again, and gather that it has lost weight. Water and decayed vegetable and animal matter have been driven off by the heat, and we notice further a change in the colour, due to these circumstances. The decayed vegetable and animal matter compose what is known as *humus*; so the general composition of soil may be stated as water, humus, and inorganic matter.
V. Depth of the soil.	We may gather from the children that in gardens and cultivated fields the soil is much deeper than on the tops of hills or on open heaths, etc. It extends as far as the spade or plough reaches.
VI. The subsoil.	By digging with the spade in the garden we soon come to a very much harder, stiffer kind of earth than the soil. This is known as the *subsoil*; while further down still—it may be many feet further—we should find *bare rock*. If there is any railway cutting in the neighbourhood, this point might be well exemplified in the next school outdoor lesson. From the diagram we also notice that some roots of plants only penetrate the soil, some extend to the subsoil, while roots of trees reach perhaps even to the underlying rocks. This leads to what would form a most interesting lesson on the reason why different trees grow best in different places. Finally, the class could be told that when they get a little older, one of the most interesting books they ought to borrow from the public library is Darwin's book on earthworms, though the title may not appear very inviting.

BOTANICAL NOTES FOR TEACHERS.

BY PROFESSOR J. R. GREEN, SC.D., F.R.S.,

Examiner in Botany to the University of London; late Examiner in Botany to the University of Cambridge;

AND F. L. GREEN,

Late Science Mistress in the Clifton High School.

In connection with the arrangements made by the School Board for London for the conveyance of botany boxes from the London parks to the various schools under the Board, the editor has asked us to furnish month by month, for the columns of this journal, a series of helpful botanical notes for practical teachers. Whilst these notes will follow the botanical specimens particularised in the schedules of the Board, they should prove equally suitable for lessons to all teachers throughout the country.

Schedule B. 15. *Rhododendron, Cuttings of Plants with Spines.*

1. *Thorns and Spines.*—Thorns and spines are morphologically different. Physiologically they serve the same end. For examples of thorns, the stems of the orange, cockspur, thorn, rhododendron, sloe, apple, pear may be examined. Considered morphologically, they are leaf-buds, which, instead of developing as usual so as to form symmetrical, leaf-bearing branches, have become arrested in their growth, and form hardened projections terminating in a more or less acute point. A thorn, then, is an irregularly-developed branch. A thorn, like other branches, always arises from the axil of a leaf, and its structure is exactly the same as that of the stem, or branch, upon which it is placed. The stem character of the thorn is very clearly seen in the rhododendron. The thorns of the sloe sometimes bear leaves. In the apple and pear, thorns are frequently changed into ordinary leaf-bearing branches by cultivation. In Farmer's *Practical Introduction to the Study of Botany* there are two good drawings of the common hawthorn—one a branch of hawthorn of the current year, showing the thorns in the axils of the stipulate leaves; the other, part of a branch of hawthorn of the previous year, showing a thorn on which are borne the scale leaf and foliage buds. Sometimes in the axil of a hawthorn leaf two or three thorns may be seen. The lateral thorns will then be found to be really branches of the middle one. When a thorn bears several lateral shoots in the axils of leaves, the whole structure is seen to be a branch terminating in a thorn.

For cuttings of plants with spines, the furze or gorse, the barberry, the holly, the thistle form good examples. Considered morphologically, they have a leaf and not a stem character. Any part of the leaf may exhibit a spiny character, owing to the non-development or diminution of parenchyma and the hardening of the veins. In the barberry the whole lamina becomes spinous, for the blade has little or no parenchyma produced between its veins, which are of a spiny character. This is the case, too, in the furze or gorse. The untransformed leaf can be seen in seedlings and in young shoots, which arise after the bush has been cut hard back. The untransformed leaf is trifoliate. The transition from normal leaves to spines can well be seen very often in those shoots of the barberry which spring directly from the base of the bush. In the leaves of the holly the veins have become hardened towards the apices, so that the margin of the leaf appears to be prolonged here and there into spines. In a holly tree that has been allowed to grow the upper leaves will be found to have grown with few or no spines.

2. *Prickles.*—The subject of prickles may be considered with that of thorns and spines. Examples of prickles may be seen in the bramble, the rose, the blackberry, the gooseberry. They will be seen to be distributed irregularly on the stem, and can be detached from it without tearing the inner tissues. Histologically they are emergences, for they are formed not only by the development of the surface covering, or epidermis, of the plant, but also by a deeper-cut epidermal layer which takes part in their formation.

Physiologically, thorns, spines, and prickles serve the same end—that of protection. They protect the plant from the attacks of beasts and insects.

Schedule A. 2 (*a*). *Cuttings of Plants with Buds.*

1. *The First Bud or Plumule.*—Take a cutting through a well-soaked bean, and examine the plumule, or small curved rudimentary bud, lying between the two cotyledons or seed-leaves. It shows two folded leaves on the outside, and lying on the inner face of one cotyledon. Compare with it bean seedlings in various stages of growth, and notice the development of the plumule. It will be found to have lengthened, and to consist of a main axis bearing leaves at points called nodes.

2. *Terminal and Lateral Buds.*—Take cuttings of oak, beech, walnut, maple, flowering currant, horse-chestnut, poplar, willow, lilac, hazel. At the apex of the main stem and the apices of its branches the surface is covered over by the young leaves, which, growing faster than the stem itself, roof it over and protect it. While the young internodes of the stem at first remain short, the leaves grow most strongly on their lower sides, and are thus enabled to arch over the stem. The apex of the stem, together with this covering of leaves, is called the bud. The bud which terminates the main stem is called terminal; buds situated in the axils of the leaves are called lateral. When growth begins, the internodes between the closely-packed leaves of the bud get longer, and a branch, or elongation of the stem-bearing leaves, is formed. It is interesting to watch the arrangement of buds. In the walnut there is a large terminal bud. Directly in the axil nearest the leaf-scar there is a very small axillary bud. Above each

leaf-scar are from two to four larger or accessory buds, which are said to be superposed—placed one above another. In the maple there are a large terminal bud, a middle axillary bud nearest each leaf-scar, and an accessory bud at each side of the axillary bud (collateral accessory buds).

3. *Scaly Buds and Naked Buds.*—Examine a terminal bud of the horse-chestnut, and compare with it a terminal bud of willow. The bud will be found to be covered with overlapping brown scales. The inner scales are less brown, larger, and more greenish than the outer ones. The innermost have small structures at their tips, shaped a little like the blades of ordinary leaves. The bud scales then really represent altered leaves. They are flattened petioles. In the horse-chestnut and in some poplars they are covered with a resinous secretion; in some willows, with a dense coating of hairs or down. The office of these scales is the protection of the bud from cold. They interpose between the tender rudimentary leaves of the bud and the air a thick coating of matter which is a bad conductor of heat. Buds thus protected are called scaly buds. The scales are sometimes called *tegmenta*. The buds of the walnut have no scales, and are said to be naked.

4. *Dormant Buds.*—Many lateral buds do not develop into branches at once, but retain for years the power of growing into branches. They are called dormant or latent buds, and the branches that ultimately arise from them are called deferred branches. Trees in spring often have their first leaves destroyed by frost. Then, after a few weeks, new sets of leaves are developed from dormant buds.

5. *Winter Buds.*—If a twig be taken from any tree in winter and kept in water in a warm room, leaves will be produced from the leaf-buds. Winter buds are formed towards the end of the season of growth, and then rest before expanding to furnish the shoots of the next season.

6. *Adventitious Buds.*—If a potato be partly immersed in water for two or three weeks, buds will form in it. These buds, because they are neither borne at the end of a stem nor in the axils of leaves, are called adventitious buds.

III. SCHEDULE A. 2 (*b*). *Simple and Compound Leaves.*

1. *Simple Leaves.*—Leaves may be defined generally as expanded lateral structures of limited growth, borne on the stem, and usually with a bud or branch in the axil. They are lateral structures because they are all borne on the sides of the stem. They are expanded structures—that is, they are broad and thin. They mostly consist of a blade (lamina or epipodium) and a leaf-stalk (petiole or mesopodium). In the wallflower, for example, there is only an epipodium. The various forms of the leaf-blade are caused by the development of its main axis or phyllopodium, its branches and their wings. In simple leaves the phyllopodium is winged. The leaves of the holly, aucuba, laurel, euonymus, fir, cedar, ivy may be compared with those of the wallflower, daisy, violet, lilac, lily of the valley, yew, arum, iris, box, groundsel, dandelion, furze. The narrowest leaf that can be found is the acicular or needle-shaped leaf of the fir. In the yew and in grasses we have a narrow leaf of the same width throughout, which is known as a linear leaf. The leaves of the wallflower are lanceolate—that is, they are broadest at the centre, three or more times as long as broad, and taper perceptibly from the centre to both base and apex. The leaves of the lilac are ovate or egg-shaped. Examples of leaves that are broadest at the middle are found in the leaves of the laurel, mallow, and white water-lily. They are called elliptical when the leaf is oval (apple, laurel, lily of the valley), and orbicular when the leaf is round (mallow, white water-lily). Examples of leaves broadest at the apex are found in the leaves of the dog-violet, daisy, box, and the leaflets of the wood-sorrel. The leaves of the daisy are spatulate or spoon-shaped. Those of the box are cuneate or wedge-shaped. Those of the dog-violet are oblanceolate, or inversely lanceolate—the widest part being nearer the apex than the base. The leaflets of the wood-sorrel are obovate, or inversely egg-shaped. The leaves of the furze are subulate or awl-shaped; they are very narrow, and taper from the base to a very fine point. Other interesting simple leaves are the sagittate or arrow-shaped leaf of the arum, the hastate or halbert-shaped leaf of sheep's sorrel, the cordate or heart-shaped leaf of the lesser celandine, the reniform or kidney-shaped leaf of the ground ivy.

2. *Pinnatifid and Palmatifid Leaves.*—Transitional forms of simple leaves are found in the leaves of the groundsel, ivy, and castor-oil plant. Not only the main axis, but also its branches are winged in a feather-like fashion in the pinnatifid leaves of the groundsel. In the ivy and castor-oil plant, instead of a main axis, a number of winged branches start from the end of the petiole, forming a palmatifid or finger-like simple leaf.

3. *Compound Leaves.*—When the axis of the epipodium remains cylindrical, and its branches of the first order become separately winged, we get a number of small winged expansions or leaflets, each attached to the axis, and each apparently independent. The whole leaf is called compound. Compound leaves are of two classes—pinnate or feather-like, and palmate or digitate. Good examples of pinnate leaves are found in the rose, bitter vetch, potato, acacia, and common parsley. In the rose the main axis of the pinnate leaf is winged only at the extreme apex, so that the leaf seems to bear a terminal leaflet, and is imparipinnate, or unequally pinnate. The leaves of the bitter vetch are paripinnate, or equally pinnate—that is, the main axis of the epipodium is not winged at all, but bears a number of secondary axes, which are winged. The leaves of the potato are interruptedly pinnate—that is, the leaflets or secondary winged axes are of different sizes. The leaves of the acacia are bipinnate, the secondary axes bearing leaflets. The leaves of the common parsley are tripinnate. The very much cut pinnate leaves of the Umbelliferæ are called decompound. For examples of palmate or digitate leaves, the leaves of the strawberry, potentilla, horse-chestnut, lupin, may be taken. In a palmate or digitate leaf a number of winged axes branch from the top of the leaf-stalk like the fingers of a hand. The strawberry leaf has three leaflets springing from a common point, and is called ternate or trifoliate; the leaf of potentilla is quinate or quinquefoliate, with five leaflets similarly arranged; and the leaf of the horse-chestnut septenate or septifoliate, with seven leaflets digitately arranged. In the lupin there are more than seven leaflets, all springing from the end of the leaf-stalk.

(*To be continued.*)

BLACKBOARD DRAWING.

ILLUSTRATIONS FOR LESSONS.

BY EDITH E. BAMFORD, ART TEACHER, EDGE HILL TRAINING COLLEGE.

I.

THE special value of sketches, made by the teacher himself, to illustrate the various subjects of the school curriculum which he has to teach, is now very generally recognised. It is often difficult to secure a printed illustration which will show the particular points of his lesson, whereas a home-manufactured sketch can be made to emphasise these special points; and though the product may be far inferior as a work of art, its value as an aid to the lesson will probably be much greater than a costly printed illustration. Again, two minutes spent with the chalk and blackboard will enable the teacher to give a more accurate impression of an absent object than many minutes of verbal description. Even if the object be present, it, or parts, may be too small to be seen by the whole class at once; and though it should first be observed by the individuals, an enlarged sketch will be helpful afterwards for class teaching and reference. An experiment that has been performed before the class can also be recorded in this way, and referred to in later lessons. Then the gradual development of a sketch before the pupils will make them analyse the form, and so they will have a more accurate knowledge of the parts, whilst the object itself, or the completed sketch, will give knowledge of the general shape. It is the gradual development of a drawing which gives the special value to a sketch made *before* the class—a value which no completed illustration, however elaborate, can have. It never fails to arouse interest or stimulate the flagging attention of the pupils. Whenever possible, therefore, the sketches should be made before the class, even though they suffer from want of finish.

The value of such sketches is recognised by the Education Department, and examinations are held each year in the training colleges to test the skill of the students in drawing on the blackboard. The syllabus states that the chief aim should be "the acquirement of freedom and skill in using chalk on the blackboard for the purpose of making drawings or diagrams useful in illustrating an object lesson to a class." It further states, "that students training for this exercise should cultivate a bold and free style of drawing. As

a rule, forms should be represented in outline only, all unimportant details being omitted." The last direction is important; for if the sketch is crowded with unnecessary detail, it will hinder the clear impression of the chief points.

The examination is divided into two parts:—

1. *Copying on a large scale a diagram such as that used for freehand drawing in the higher standards of the Elementary School Drawing Syllabus.*—The copy is placed before the candidate for examination, and he is expected not merely to make a correct enlargement of it, but to show, as to a class, the right method of procedure. He must show the various stages of spacing, blocking, and working the details; he must prove that he can demonstrate the elementary principles of design before a class.

2. *Sketching common objects from memory.*—The choice of these objects is left entirely to the teacher, except for one stipulation—that they must be such as might be suitable for object lessons. In this part of the work, objects showing perspective and based upon the principles of geometric models can be selected—for example, a table, chair, desk, cup and saucer, water-bottle and tumbler, beaker, collecting-jar, Woulff's bottle, and other simple science apparatus; or natural objects, such as leaves and flowers. At the examination, from a list of from twelve to twenty such objects, the student is required to sketch one, ten minutes being allowed for this work and ten minutes for the freehand copy.

The syllabus, however, does not cover the whole ground if a teacher is training to illustrate his lessons. He is then required to sketch not only common but also *un*common objects—the earthworm and elephant, the grain of wheat and banana tree, the snow crystal and the solar system. It would be absurd to expect him to sketch all objects from memory, but he should know how to make an enlarged copy from an illustration, and this requires some training and skill—training differing from that required to enable him to sketch an enlargement of a freehand diagram. A system has been advocated for training teachers to sketch animals which consists of juggling with a few forms, chiefly ellipses and circles, to bring about a particular result. Thus, two ellipses put together in certain ways will give some slight resemblance to a cat or bird. But such training can have little real value. Firstly, the lines are so simplified that they are quite inaccurate, and give a very imperfect representation of forms; and secondly, the one position evolved by this process is seldom wanted for illustrating a lesson. Instead of juggling with lines with profitless results, the student should practise copying really good printed illustrations of animals.

But the blackboard is only suitable for outline sketches; shaded drawings can never be very satisfactorily worked on it. Frequently, however, a shaded sketch is needed which will show distance or the modelling of the form. Such effects are most clearly and easily obtained on brown paper, which will itself represent the middle tone, whilst white chalk and charcoal will give the light and dark tones. It is astonishing how quickly a good, bold effect can be obtained by the judicious use of these materials, and it is a pity their value is not more widely known among teachers, especially among teachers of infants, for capital illustrations can be made with them for kindergarten and object lessons.

The illustrations here briefly described require only such materials as might be found in any schoolroom, and only so much skill as might be expected from any teacher. Yet it frequently happens that if a teacher is called upon to illustrate his lesson before his class, he considers he has an impossible task assigned him; and should he make the attempt, the result is so weak and inaccurate that it is worthless. If such were necessarily the case, it would mean that, to a great extent, his art training was useless; for the first aim of a teacher's art practice should be to enable him to illustrate his lessons, not to make him an artist or even a teacher of drawing. But with the knowledge he has acquired in elementary drawing, with a little common-sense to aid him in making a choice of subject and detail, and with considerable practice to enable him to make a bold, free line with rapidity and accuracy, he should find no difficulty in sketching before his class.

The papers to follow will be written principally for teachers with only a very elementary training—for those who have practically done nothing beyond the second grade freehand, model, and light and shade drawing of the South Kensington syllabus. No new principle will be enunciated, and the student will only be shown how to apply what he already knows to making illustrations for lessons. Some of the work will be very elementary, and the drawings will not be absolutely correct in all cases; for difficult forms will have to be simplified, and so sacrificed to speed of execution. The first papers will treat of blackboard drawing as required for the South Kensington examination, and hints will be given on sketching the freehand copy, the spacing and blocking, and emphasising leading lines. A few common objects will also be given, showing how the principles learned in model drawing can be applied to them, so that they can be reproduced from memory. But other papers will be written on copying and enlarging outline sketches from printed illustrations, and drawing flowers and leaves, and hints will be given on making brown paper illustrations.

It is hoped these papers will help the teacher who considers himself unable to illustrate his lessons, or who is diffident about making the attempt. The increased pleasure the pupils will experience in the illustrated lessons, together with the clearer knowledge gained thereby, will more than amply repay him for the time spent on training in this important branch of his work.

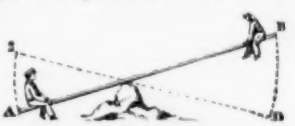
PRACTICAL ELEMENTARY SCIENCE.

AN EXPERIMENTAL COURSE COVERING THE REQUIREMENTS OF BOTH THE DAY AND EVENING SCHOOL CODES IN PHYSICS AND CHEMISTRY.

BY THOMAS CARTWRIGHT, B.A., B.SC.,

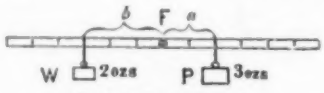
Author of "Practical Chemistry," "'Section One' Physiography," etc.

The Balance.—To understand the balance, it is necessary that one or more lessons should be spent in considering levers. The first word in this connection is always "see-saw," and a better introduction to the study of levers could not be desired than is provided by the ever-popular see-saw, which might itself be used in the classroom as a practical and pleasant preliminary and adjunct to the lesson. The necessity for a rigid bar, and a fixed point about which the bar can swing, is apparent; and the definition of the lever as a simple machine, consisting of a rigid bar movable about a fixed point, need not be delayed. The derivation of the word "lever," from the French *lever*, "to raise," will also help to suggest the kind of work that this simple machine is able to perform. A few words about machines in general will be appropriate, as children seem to have a vague idea that a machine itself furnishes energy. It should be made clear that the machine is matter, that it is consequently inert, and therefore can only at most give out as much energy as is put into it: generally not so much comes out of the machine as is put into it, some being lost on account of the friction of the various parts of the machine. This will lead to a short consideration of the use of a machine. If a boy is asked to take down a map, he will naturally use the long arm for this purpose. How does this help? It enables the boy's energy to be applied to the map—that is, where it is wanted; and this is the way in which machines always help—namely, in using energy to better advantage than would otherwise be possible, so that even if a little of the energy is lost, there is still great gain, insomuch as the available energy is put to the best possible advantage. A word may also be said as to the property of matter whereby they transfer energy, as it is in machines that this property is most conspicuously encountered. Returning again to the see-saw, it may be



SEE-SAW.

pointed out that a bigger boy may come closer to the fixed point than a smaller boy and yet be able to balance him; so that when the weights are unequal, distances from the fixed point are also unequal. This will be sufficient by way of preliminary, and the class may now be set to work to discover the law of the lever—that is, the principle of moments. All that will be needed for this purpose are a metre scale and a darning needle, together with either some of the larger brass weights that are in the weight boxes, or bags of sand or shot of known weight. The metre scale is pierced at the centre, and the needle is either fixed in the wall or, better



First Order of Levers.

still, is made to rest on suitable supports, as in the diagram. Different weights are placed at varying distances from the point of suspension, and when the lever has been brought into equilibrium, the distances and weights for the two sides of the fixed point are recorded, and after many experiments the products of weight into distance on each side are recorded and compared as below.

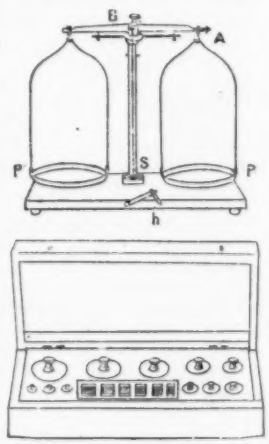
Left-hand Side.			Right-hand Side.		
Weight.	Distance.	Product.	Weight.	Distance.	Product.
12 grs.	20 cms.	240	25 grs.	$9\frac{3}{5}$ cms.	240

The rule should now be made clear, if it is not already so—namely, that the weight on one side is just as many times greater than the weight on the other side as its distance is less than the corresponding distance on the other side; or that weight multiplied by distance on one side = weight multiplied by distance on the other side when there is equilibrium, or, again, power multiplied by its arm = weight multiplied by its arm. However it may be, great care should be taken to have a clear understanding of the whole process: for example, it should be shown that the smaller weight moving the larger one has to move through a much greater distance, and therefore what is gained in power is lost in speed—that is, the larger weight moves more slowly than the smaller weight by which it is overcome. Again, it should be pointed out that the work done is the same in the case of both the greater and the lesser weight. The only difficulty here will be to explain how distance can be a factor in work; but some homely example, such as that of a man carrying a weight of 10 lbs. for 5 miles, compared with another man carrying a weight of 20 lbs. for $2\frac{1}{2}$ miles, will make this clear. Care must be taken to guard against the fallacy that energy can be created by a machine. Many useful exercises on moments can be given, such as the weighing of the lever itself by placing the fixed point at some other part of the lever than the middle. Thus, suppose a metre scale is pivoted about a point one-quarter the distance from each end, and carries weights of 20 and 30 grams, 40 and 30 centimetres distant respectively from the fixed point, and that these produce equilibrium: the moments of the two sides are $30 \times 30 = 900$ and $40 \times 10 = 400$. To this must be added the moments due to the lever itself, the weight of which we will call x, and it is evident that three-quarters of this act at one side and a quarter at the other, the point of application being $12\frac{1}{2}$ in one case and $37\frac{1}{2}$ in the other; hence

$$900 + 12\tfrac{1}{2} \times \frac{x}{4} = 400 + 37\tfrac{1}{2} \times \frac{3x}{4},$$

from which equation the weight of the lever may be shown to equal 20 grams.

Application to the Balance.—By far the most important point to bear in mind in this lever work is its connection with the balance, which must be shown to be a lever in which the distance from the fixed point is the same on each side, which may be expressed by saying that power's arm equals weight's arm; bearing which in mind, it should be easy to show that when there is equilibrium, power equals weight—that is, the two masses or weights are equal, hence the efficacy of the balance in weighing. Numerous experiments should be worked with the metre scale, with weights at equal distances on each side of the fulcrum, when it will always be found that equilibrium is only possible when the weights on each side are equal. It is a useful exercise to test the balances to see if they fulfil this condition. To do this, put weights in the left-hand pan of the balance, which has been previously adjusted, and exactly counterbalance these weights with shot, tinfoil, or other suitable substance. Having done this, carefully remove the shot, etc., from the pan, and again counterpoise the weights with shot. Next remove the weights from the left-hand pan, and in their place put the shot previously weighed. We know that the two assortments of counterpoise are exactly of the same weight; therefore, if the balance is not exactly at equilibrium, there must be some disparity in lengths of the two arms, and the balance is therefore unreliable. The pupils will probably not understand why there may be a difference between the weights and the shot that replaces them; hence a little trouble should be taken to make this clear, the explanation being that there is a possible inequality of the arms. The parts of the balance should now be examined, and a few cautions should be given as to how it should be used. 1. The weights should always be put on the right-hand pan, and the object to be weighed on the left-hand pan. Why? A little thought should bring the desired answer — namely, that the weights need most manipulation, and should therefore be placed in the pan nearest to the deftest hand, to wit, the right. 2. No weights should be placed in the pans whilst the balance is moving. The reason for this is obvious. The knife-edges supporting the pans, as well as the agate plane upon which the central knife-edge works, must not be damaged in any way, or otherwise the delicacy of the instrument will be marred. Hence the unwisdom of bumping the pans, which is bound to happen if weights are added before the lever has brought the balance to rest. This will be appreciated all the more when the pupils understand that the knife-edges are not carrying any weight when the balance is at rest. 3. Never touch the weights with your fingers; always use the forceps provided for that purpose. The accuracy of the weights must be unimpeachable; hence the greatest care must be taken not to dirty or corrode them, as may easily be done if they are handled with the fingers. It is wise to forcibly impress upon the beginner's mind the absolute necessity for treating his balance with the utmost care, as no amount of care will be of any avail in working if, when the time for weighing arrives, the balance to be used is in any way defective. As said in our first lesson, the balance is the one piece of apparatus the delicacy and accuracy of which must be above suspicion.



Balance and Weights.

The Weight Box.—A very interesting quarter of an hour may be spent in examining the weights to be found in the weight box. In the first place, the arrangement for reducing to a minimum the number of weights to be used should be enlarged upon. Beginning with the milligrams, show the weights, and point out that the series 5, 2, 2, 1 is able to make any number of milligrams from 1 to 10, which is the reason for which this peculiar selection has been made. Show that the same selection has been made in respect to the centigrams, which also are 5, 2, 2, 1; and, finally, draw

attention to the decigrams, etc. Add together all the weights in the box, and show that every weight from the milligram up to this total can be represented by the weights in the box. Let the pupils draw a diagram similar to that which follows, and instruct them to write in the several squares the weights to be found in the box—first of all the fractions of a gram, and then the multiples of the unit.

·5	·2	·2	·1	decigrams.
·05	·02	·02	·01	centigrams.
·005	·002	·002	·001	milligrams.

If by chance the box of weights used divides the weights on the plan of 5, 2, 1, 1, show that this arrangement is equally capable with the other of expressing all the weights, from the highest to the lowest; and that it does not express any one of these twice over, as is the case in the above, where 5, 2, 2, 1 = 10—that is, these four are equal to the next weight above them—which is not necessary.

The Rider.—As the use of the rider depends entirely upon the principle of moments—that is, the principle underlying the lever—it will be interesting to refer to that useful little piece of apparatus at this juncture. First of all, the rider should be weighed, and so be shown to exactly equal a centigram in weight. The question should next be asked, "When does it weigh a centigram?" This should bring the fact to the minds of the pupils that distance from the fixed point is a factor not to be neglected; and the reply should come that the rider only balances a centigram in the left-hand pan when placed exactly over the centre of the pan—it being quite immaterial whether it is on the beam or in the pan, so long as it is over the centre of the pan, as it is only the perpendicular distance from the point of suspension that counts. Next, the rider should be placed over the central pillar—that is, no distance from the fixed point. What does it balance now? Obviously nothing; hence the fact has been established that the rider may balance anything, from the centigram to nothing. If now the beam is divided into ten equal parts, it should be clear that when one-tenth of the beam is distant from the fixed point, the rider balances one milligram, and so on up to ten milligrams, or one centigram, as before pointed out. If the milligram weights are now shown, it will be evident how very desirable it is that we should be delivered from the necessity of using such easily-lost weights; hence in all delicate balances the beam is divided, and the rider is used, and not only is it possible to weigh to milligrams, but even to the tenth of a milligram on a fairly delicate balance. The pupils should now be permitted to use the balance—at the start, under close supervision—being allowed to weigh a halfpenny, a shilling, a watch-glass, etc., all of which weighings should be recorded in the laboratory book, wherein also should be carefully written all the rules to be observed in the use of the balance.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

ENGLISH.

The Subject is again becoming popular. THE popularity of English as a class subject is again becoming manifest. Time was when this subject was compulsory. Parsing and analysis upon paper was then regarded as the highest ideal in English. The elementary science boom, and the removal of English from the obligatory list, wellnigh swept the subject from the primary school. We are now experiencing a turn in the tide, and the mother-tongue bids fair to recapture its old and true position. The increase of scholarships from the primary to the secondary schools, and the necessity for a good groun lwork in English for intending pupil teachers, have helped in replacing this subject upon the time-table.

* * * * * *

English in its wider Significance. It seems to me that we ought to make our subject, English, embrace a much wider course than was formerly the case. Even nowadays one often finds that written composition, for instance, is treated quite apart from its relationship to English. The recitation lesson, again, which to my mind should be the best English lesson of the week, is often regarded as having no part or lot with instruction in one's own language. I recognise fully that the Code schemes have perhaps in the past been responsible for this condition of things. Let us inoculate our curriculum with the secondary school notions, and deal broadly with this subject. Our aim should be to work towards the correlation and dovetailing of the subjects as set forth by the devotees of Herbartian philosophy.

We will then always bear in mind that the object in teaching composition, recitation, and grammar is to give instruction in the art of speaking, writing, and understanding the English language.

* * * * * *

English as a Class Subject above Standard III. Let us next consider how this is to be best done in the average school. I at once give it as my opinion that the grammatical section should not be taken seriously below the fourth standard. English, dealt with as composition and recitation, will be ample for the first three standards. A very good arrangement is to offer elementary science in the form of object lessons in Standards I., II., and III., and English as the corresponding class subject for Standards IV., V., VI., and VII. In considering English from the class subject point of view, we will for the present leave the recitation and composition branches of the subject.

* * * * * *

Suggestive Scheme. There are several schemes laid down in the Code in the supplement to Schedule II., but teachers are at liberty, of course, to submit their own schemes as alternative courses if they so prefer. I fancy a scheme suitable to some schools might be constructed by making selections from all of the five Code schemes. For such, taking another class subject in the lowest three standards, I submit the following:—

Standard IV.
1. The nature and use of a sentence.
2. The function of the words used in simple sentences.
3. Illustrations of the use of each part of speech.
4. Correction of errors in speaking and writing.

Standard V.
1. The building up of sentences by speech and writing.
2. The analysis of simple sentences.
3. Inflection of nouns and verbs.
4. The use of each part of speech.
5. Correction of errors in speaking and writing.

Standard VI.
1. Parsing and analysis of compound sentences. Examples to be chosen from the piece of recitation for the year.
2. Simple paraphrasing.
3. The meaning and use of the common prefixes.
4. Rudimentary study of the language of the recitation for the year.
5. Lessons in punctuation.

Standard VII.
1. Parsing, analysis, and paraphrasing from the poetry of the year.
2. A short historical outline of the growth of the English language.
3. Closer study of the language of the poetry for the year.
4. Exercises in the right use of commercial terms.
5. Lessons in abridging documents and letters.

This syllabus is somewhat extensive in appearance, especially in the highest standards. It is possible, however, I think, to so arrange it as not to find it practically too much. Let us consider the Standard VII. course as set down above, for example. Analysis, parsing, and paraphrasing are

simply a continuation of the work of previous standards. Of course, much of this should now be written.

Fifteen lessons will suffice probably for a brief historical outline of the language. Ten lessons might be given to exercises in the right use of commercial terms, and fifteen to *précis* work. You will then have a wide margin left for the study of the author, together with the paraphrasing, analysis, and parsing.

I will assume that you allow two and a quarter hours per week for your class subject, and one hour for the recitation pure and simple. That gives you three and a quarter hours for the whole subject. By making your poetry for the year the centrepiece of your scheme, you economise time and associate subjects. I should advise that the two and a quarter hours be divided into three lessons of three-quarters each, and the hour for reciting appear as two lessons of thirty minutes each.

Assuming that there are forty-four working weeks in the year, you would have one hundred and thirty-two lessons in the class subject, together with eighty-eight lessons in reciting. Subtracting the forty lessons devoted to sections 2, 4, and 5, you still have ninety-two lessons, or more than two per week, available for sections 1 and 3, to say nothing of the eighty-eight lessons in recitation, many of which can, of course, be used in studying the author.

* * * * * *

English for the Lower Standards to be taught indirectly. Although English would not directly form part of the curriculum under the circumstances named above, yet of course, in the object lessons, much time will indirectly be spent upon teaching the children to give answers orally in whole sentences. In fact, here we have again a specific instance of the correlation of subjects, for by so doing the teacher is practically teaching two class subjects. Compare Course B in English in the supplement to Schedule II., where the work for Standards I. and II. is laid down as follows:—

Standard I.
Answering questions orally in whole sentences.
Standard II.
Oral composition. Answering questions about familiar scenes and objects in whole sentences.

I have been in many schools where these requirements are covered in the object-lesson scheme, although no mention of "English" as such appears on the time-table. It would be perhaps a good thing to give Standard III. just one lesson per week in English, so that the subject shall not be entirely new to the children on reaching Standard IV.

* * * * * *

Alternative Schemes where Standards V. and VI. are grouped. Inasmuch as in very many schools Standards V., VI., and VII. are taught together as one class, I will submit alternative schemes suitable for this group. One scheme would be taken one year, and the other scheme in the year following.

Scheme I.—Standards V., VI., and VII.
1. Careful study of the poetry for the year.
2. Simple analysis, illustrated chiefly from the poetry.
3. The function of each part of speech.

Scheme II.—Standards V., VI., and VII.
1. Careful study of the poetry for the year.
2. Simple paraphrasing, illustrated mainly from the poetry.
3. Correction of the common errors in speaking and writing.
4. Revision of the work of Standard IV.

I propose next month to deal with the teaching of the poetry, and to show how this subject should be connected with the class subject, English.

Letters should be addressed—Inspector, care of the Editor, 33 Paternoster Row. For replies by post, two stamps should be enclosed, and an addressed envelope.

Just Ready. Price Two Shillings and Sixpence.
Hastwell's
PHOTOGRAPHIC REPRESENTATION OF CASTS.

T. NELSON AND SONS, 35 and 36 Paternoster Row, London; Edinburgh, and New York.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

THE BARRAGE OF THE NILE.

THE British occupation of Egypt promises to become an untold blessing to a people long ground down by the oppression of corrupt rulers, and to whom nature has dealt out her blessings with a niggardly hand. The downfall of Mahdism, and the restoration of the southern provinces, have now given the necessary opportunity for the British to turn their attention to the improvement of the natural resources of the country.

That Egypt is "the gift of the Nile" is just as true now as it was in the days of Herodotus. Egypt is the Nile, and the Nile is Egypt. The whole of the cultivable land consists solely of Nile mud, or of land to which the Nile may be artificially conveyed. The periodic inundation of the river is an event of the gravest national concern. A decrease of a few feet in the flood may mean the cutting off of thousands of acres from the possibility of cultivation, and may reduce large masses of the population to absolute starvation.

BLACKBOARD ILLUSTRATION: RIVER NILE.

The annual rise of the Nile is due to the fall of the tropical rains. It commences to rise in July, and attains its maximum height about the end of September: at Thebes the average rise is 36 feet, and at Alexandria 25 feet. By January the river loses half its height, and about the end of April subsides to its minimum.

April, May, and June are trying months to the people of Egypt. The fierce sun and the absence of rain strain their physical endurance to the uttermost, and all eyes turn eagerly to the national salvation, the Nile. At last the welcome rise is announced, and the whole nation breathes a sigh of relief.

Everywhere rude canals, trenches, and reservoirs are prepared to receive the precious fluid, that it may be husbanded to the fullest possible extent. Even the ancient Egyptians were keenly alive to the necessity of irrigation to further enlarge the strip of land which the Nile has wrested from the desert. There are numerous irrigation canals, and the most famous of these channels is reputed to be the work of Joseph during the time that Pharaoh "made him ruler over all the land of Egypt." Whether popular tradition be right or not, the stream is known as the Bahr Yusuf, or Waters of Joseph, to this day.

Yet, notwithstanding the value of water to the surrounding country, nature, as if in wanton extravagance, pours nine-tenths of the waters of the Nile into the sea. British enterprise is now fully employed in solving this difficult problem, in the provision of two immense reservoirs, by means of which vast volumes of water will be kept back in reserve, to be dealt out to the thirsty land in due season. We can, however, claim no originality for the idea of thus conserving the natural energies of the Nile.

THE EXISTING BARRAGE.

Across the river, ten miles below Cairo, stands an enormous bridge, over a mile in length, where the river divides into its two great Rosetta and Damietta branches. It was commenced in 1837, from the designs of Mougel Bey, a

Frenchman standing high in the esteem of Mehemet Ali, the great Egyptian ruler who shook off the Turkish yoke. After enormous expense of time and life, the great work was completed in 1861. The foundations of the work, however, had been so carelessly prepared that two full years elapsed before it was deemed prudent to test the capabilities of the dam. One day the sluices of the one hundred and twenty arches were closed, and the river commenced to rise. Before long the weight of the water began to push the whole structure out of position, and the sluices had to be reopened to prevent the piers being swept bodily away. Twenty years passed away, and practically nothing was done to mend matters. An eminent engineer estimated that it would cost £1,500,000 to remedy the defects, while it was also seriously discussed whether it was not desirable to destroy the whole structure, at a cost of half a million.

With the British occupation of the country the matter received very prompt attention. Some of our most famous Indian engineers were consulted, and the dam was put in thorough working order for the sum of £500,000. The gain of water was so beneficial to the agriculture of the province, that attention was drawn to the needs of barrage elsewhere. As the result of a very careful survey, it was decided to construct dams and reservoirs at Assiout and Assuan, at a cost of about £5,000,000; and these vast works are now being carried out by Messrs. Aird and Co., the great British contractors. The work is to be paid for by thirty annual instalments of £166,666, commencing at the completion of the contract. As it is calculated that the extra water supply will provide £400,000 per annum additional revenue, the financial aspect presents no difficulty.

The Assiout and Assuan Dams.

As soon as it was decided to proceed with these additional works, 20,000 men commenced their gigantic task. At Assuan, a dam, nearly two miles long and 60 feet high, is being constructed, and the foundations in this case consist of immense beds of concrete. The supplementary dam at Assiout, too, is being carefully constructed. Assiout and Assuan at the present time resound with the hundred and one noises incidental to such huge enterprises—the blasting of rock, the creaking of cranes, the steam excavators tearing up the earth, the improvised railroads for removing the débris, and the ring of the pick and shovel. The burly English navvy works shoulder to shoulder with the puny fellaheen. Christian, Mohammedan, Copt, and Jew toil from Monday morning to Saturday night. The exigencies of the work in hand will not allow the Mohammedan and the Jew to take their day of rest on the Friday and Saturday respectively, for the contractors wisely decided that Sunday shall be the day of rest for all.

How different from the Egyptian methods of even the present century! When Mehemet Ali constructed the Mamoudieh Canal from the Nile to Alexandria, thousands of men, women, and children worked unpaid under the lash, removing the earth with their hands instead of tools. The work only occupied a single year, yet the death-roll amounted to 25,000.

A depth of 65 feet of water will naturally cause some alterations in the physical features of the river at Assuan. The removal of the First Cataract will be compassed, and for this navigators of the Nile will be thankful; but the drowning of the greater part of the island of Philae, with its interesting ancient ruins, will be distressing to the antiquarian.

The new barrages will not be completed until about 1902, and some few years after that will have to elapse before the results can be assessed.

Even as in old time there was "corn in Egypt," the country is still one of the world's granaries, since it is usually able to produce more food than suffices for the needs of its people. Two crops per annum is now the rule, but with increased water supply there is no reason why there should not be three or four, as there are even now in specially favoured districts. The chief agricultural products are cotton, millet, maize, rice, sugar, etc. The yield of these will at least be very considerably increased, even if crops entirely new to Egypt are not introduced as a direct result of the engineering works now in progress.

ENTERTAINMENT SEASON.

Teachers on the look-out for a really "charming" fairy kindergarten cantata will thank us for once more calling attention to Mr. Thomas Murby's "Queen Iloveyou's Five-o'clock Tea." This was very favourably noticed by us on the occasion of its first publication; and having had the privilege of witnessing a recent performance of the same, we are pleased to be able to confirm all we said as to the suitability of this original and successful cantata. It consists of eleven numbers, occupying fifty-two pages of engraved music (folio size), and takes about forty-five minutes in performance. With the music, full directions are given as to costumes, dances, etc. From a prospectus before us, we notice that the leading organs of the daily and weekly press, as well as our most prominent educational journals, have been unanimous in publishing their high praise of the work. The published price of the cantata is 2s. 6d. net, and cheap sol-fa editions of the choruses and words are also issued. Our readers should apply for full particulars to Mr. Thomas Murby, publisher, 3 Ludgate Circus Buildings, E.C.

TOUR AND TRAVEL.

The Polytechnic Institution of Regent Street is well to the fore among tourist agents in the issue of the new programme of Co-operative and Educational Holiday Tours for 1900. The book contains an excellent and varied selection of tours to practically all parts of Europe. In view of the International Exhibition to be held in Paris this year, exceptional arrangements have been made with a view of combining a Swiss holiday with a visit to Paris. There are also excursions to the Rhine, as well as weekly trips to Holland, from Easter and throughout the season. Special parties are being formed to visit the village of Ober-Ammergau, for the purpose of witnessing the great passion play performed every ten years. The fullest particulars are given in reference to the Norway Yachting Cruises. All tours, extensions, etc., are announced at incredibly low rates, and we can with confidence recommend the Polytechnic Holiday Tours. Our readers should send to 309 Regent Street, London, W., for a copy of the Illustrated Handbook of Tours.

LEARNING LANGUAGES BY LETTER-WRITING.

In connection with our scheme of International Correspondence for Teachers, our readers are reminded that lists of correspondents are regularly made up at this office and sent to Paris. Those who would avail themselves of this opportunity of correspondence with French teachers are invited to send their names and addresses to the editor of this journal. It is hardly necessary to repeat that our subscribers are paired with correspondents free of charge.

For the benefit of our readers, we quote the following notices from the March number of the *Review of Reviews*. All communications concerning these should of course be made direct to the office of that journal, Mowbray House, Norfolk Street, Strand.

"A Greek gentleman would like to correspond with an Englishman in Modern Greek and English.

"Professor Hartmann writes that for German correspondents not only age, but occupation of father, should be given—similarity of social condition ensuring a more lasting connection. All names must be accompanied by a twopenny-halfpenny stamp.

"I am asked why *adults* should pay one shilling, and can only beg my readers to try and realise the cost and labour of the correspondence. For one adult alone I may have to write four or more foreign letters or postcards, besides in many cases paying a fee, and no foreign newspaper helps here.

"Professor Vaché of Nontron writes that he can take three English lads at £20 a year each if they will help his boys to talk—several lads have been there already. Of course the fare is not luxurious, but is sufficient. Boys can be placed at Limoges also under the same conditions. Would any young English girl like to go into a French school, whose head is a Protestant, on same terms? I can only answer letters in reply which enclose stamped addressed envelopes.

"We have always addresses of French and English people willing to take *pensionnaires*.

"The Easter Holiday classes at Université Hall open at the same time as the Exhibition. For particulars, inquire at 95 Bd. St. Michel, Paris."

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Head-Master of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of "Scholarship School Management."

SPRING EXAMINATION, 1900.

Notes and Hints on the Test Examination.

CANDIDATES.

GEOGRAPHY.

Question 1 is entirely text-book work.—Question 2 was fairly well answered; but candidates should avoid the continual repetition of such phrases as, "We now pass."—Question 3. A sketch-map would answer this question, as far as giving names and positions, thus allowing more time to write of climate, productions, towns, and people.—Question 4. A sketch-map and a tabulated statement is the best form of answering questions of this kind.—Question 5 should also be answered in tabular form.

HISTORY.

Question 1. Alfred was called "Great" from his many-sided excellence as a warrior, a statesman, a legislator, an educationist, an author, a churchman.—Question 2. Text-book.—Question 3. The Fenians were an Irish anarchist society which endeavoured to promulgate their tenets by terrorism.—Question 5. The advance during the present reign has been so extensive that many students were apparently bewildered by the choice of topics. A few words on population, revenue, social conditions, wages earned, general morality, education, science, and inventions—for example, the uses of steam and electricity, photography, anæsthetics, etc.—would be as much as could be expected.

ARITHMETIC.

1. (*a*) The only way to show the *reason* for the rule of finding the G.C.M. is to break numbers up into factors, and find the G.C.M. by inspection, then showing that the rule brings the same number. (*b*) The answer is **15** by inspection; yet several multiplied the numbers together, and then found the G.C.M. (*c*) One number will be $35 \times 11 \times 13$; the other, $35 \times 7 \times 17$.

2. $\frac{3}{5}$ means that a whole is divided into 9 *equal* parts, and 5 of them taken. The word *equal* must not be omitted. To make unity, $\frac{4}{9}$ must be added—that is, $\frac{1}{2}$ of $\frac{8}{9}$.

3. Answer, 1.

4. Answer, 6·19.

5. Answer, £112, 17s. 6d.

ENGLISH.

2. *Thanks* is not objective case governed by *said*, but by some such word as *give* (I give thee thanks); *like* is an adverbial conjunction; *thunderbolt* is nominative to *parts* understood.

3. In several cases the *use* of the suffix was omitted.

4. See text-book.

5. The definitions of these terms were very poor. Avoid such statements as, "The nominative of address is when a person is spoken to." This is meaningless.

MUSIC.

3. *Pitch.*—The pitch of a note depends upon the number of vibrations producing it—the greater the number of vibrations the higher the pitch. The standard of pitch in England is 256 vibrations for **doh**, or 512 for **doh**^{1}. Tuning-forks usually give the latter note.

ELEMENTARY SCIENCE.

1. When a body just floats, its weight is equal to the weight of liquid displaced.

In water $5\frac{1}{2}$ oz. are displaced, in oil 5 oz., in brine $5\frac{3}{4}$ oz.

$$\text{Therefore, S.G. of oil} = \frac{5}{5\frac{1}{2}} = \frac{10}{11};$$

$$\text{S.G. of brine} = \frac{5\frac{3}{4}}{5\frac{1}{2}} = \frac{23}{22} = 1\tfrac{1}{22}.$$

2. This can be worked out by ruler and pencil.

3, 4, and 5 are text-book questions.

FIRST YEAR.

GEOGRAPHY.

1. The point required was, the "German Empire" is a federation of states, and not *one* state. The government was not well known. This should be looked up.—2 and 3. Text-book.—4. Very few attempted this question. Since the government of India was taken over by the Crown, in 1858, there has been a steady advance. Large sums of money have been spent on railways, roads, canals, harbours, lighthouses. Irrigation works provide water for the land when the rains are below the average. Education has been furthered by schools, colleges, and universities, and by admitting Hindus to subordinate civil service positions. The women of India have reason to be grateful to Lady Dufferin and the ladies of the Zenana Mission, who have brought them relief from suffering and death. Trade, commerce, and manufactures have been developed—for example, the growing of cotton, tea, opium, jute, etc. Kaiser-i-Hind means Empress of India.—5. Tabulate all answers of this kind.

HISTORY.

1. This question did not include the battle of Hastings. The chief points subsequent to this event were:—1066. Romney occupied (October 20); Dover taken (October 21); Canterbury taken (October 29); surrender of London (December).—1067. Conquest of the west, and capture of Exeter.—1068. First conquest of central and northern England: Edwin and Morcar submitted.—1069–1070. Final conquest of the north; harrying of northern counties; capture of Chester.—1070–1071. Revolt in the Fen country under Hereward; revolt of Edwin and Morcar; death of Edwin and submission of Morcar.—1071–1072. Conquest consolidated by building castles.

2, 3, 4. See text-book.

5. The monasteries were the almshouses of mediæval times, where the poor and destitute could always obtain relief. They employed also many labourers, and the monks were easy masters to work under. By the "Dissolution" not only were the usual channels of relief closed, but the means of employment were taken away, since the new owner converted the land into sheep-farms, where one shepherd was required instead of a dozen labourers. This explains the misery which ensued amongst the poor, and also why they sided with the Romish rather than the Protestant Church—for example, in the "Pilgrimage of Grace." Ket's rebellion was due to these causes. The penal statutes that were passed were useless, the various forms of voluntary relief were totally inadequate, and it was not till the Poor Law of Elizabeth (1601), by which each parish was made responsible for the maintenance of its own poor, that any adequate solution of the difficulty was found.

ARITHMETIC.

1. *Ratio* is the relation between two quantities of the same kind with regard to magnitude. *Proportion* is the equality of two ratios. Answer, 11 cwt. 3 qrs.—2. £1001.—3. 60%.—4. $4\frac{1}{2}$ years.—5. 5062·4564 litres.

ENGLISH.

3. The etymology is not very well known. Arrange derivations thus:—

Superfluous	Prefix.....	super = above or beyond.
	Root.....	fluo = I flow.
	Suffix.....	ous = full of.

4. The general run and meaning of the poem has in many cases been overlooked. Few could give anything like a continuous account of the English character as depicted by Goldsmith.

Algebra.

Answers.—1. 1, −3, 3. 3. 8 and 5.

Elementary Science.

1. The sensation which we call cold is due to abstraction of heat from the body: the better the conductor, the quicker is the heat taken away. Hence the iron, being a better conductor than the wood, takes heat away more rapidly, and thus produces a sensation of greater cold.

2. Light is invisible, and therefore it is impossible to see a ray of light; what is seen is the dust-motes made luminous by the light.

3. Text-book.

4. As the temperature sinks to 39°, the surface layer contracts and sinks till *all* the water is at the same temperature. From 39° to 32° the water expands, and the surface water falls in temperature, but expands and floats. At 32° the water changes into ice, and further expands; hence the ice floats, because, occupying greater space, it is, bulk for bulk, lighter than water.

5. The refraction in this case is best shown by means of a diagram.

Second Year.

Geography.

The term "Dominion of Canada" is best explained by taking the point historically from the North America Colonies Act of 1867, pointing out when the various colonies joined, etc. The main fact to be noticed is that it is a *federation* of states.

The other questions may be answered from the text-book.

History.

1. The chief points were:—The levying of taxes; arbitrary imprisonment; the dispensing power; keeping a standing army; the squandering of money granted; and absolute rule. They were settled by the Petition of Right, the Habeas Corpus Act, and the Declaration and Bill of Rights. The provisions of the latter were all directed against the unconstitutional practices of the Stuarts.

2. A genealogical table should be used to explain the succession to the Spanish throne. Details of the war were not asked for.

3. Few point out that Dr. Sacheverell's trial was made a *political* contest between the Whigs and Tories. The South Sea Scheme was a genuine concern, but was wrecked through over-capitalising and extravagant promises.

4. Text-book.

5. The development of the extent of the empire during the present century has been most remarkable. In Europe we have gained Cyprus; in Asia, a large part of India, Ceylon, Hong-Kong, Borneo, the Straits Settlements, Aden, Perim, etc. In Australia all the colonies have been developed, New Zealand and all the Pacific Islands added; and in Africa we have acquired Egypt, the Soudan, Nigeria, the whole of British South Africa, and British East Africa. In America the interior and west of Canada have been colonised.

Arithmetic.

Answers.—1. £5, 2s. 9½d. 2. £27, 0s. 5½d. (nearly). 3. £1, 11s. 2d. 4. £500. 5. 21 feet and 35 feet.

English.

1. The chief changes were:—The loss of Anglo-Saxon inflections; the loss of compounding words; and the introduction of Norman-French, and consequent strife of tongues, which lasted two hundred and fifty years.

2, 3, and 4 may be answered from the text-book.

5. *Effluvia* is plural, and the verb is singular. *Each* must be followed by the singular—*himself*, not *themselves*. *Has* should be *have*, the pronoun *that* being plural. There is no noun to which *having finished* relates; read, When the chapter was finished, etc. *Other* is unnecessary.

Shakespeare himself *was* a dramatist. To say that he is greater than any dramatist is to say that he is greater than himself. Insert *other* before *dramatist*.

Elementary Science.

1. Air, coal-gas, chalk, and water are *not* elements.

2. Prepare by the action of HCl on Zn. When hydrogen burns, it is uniting with oxygen to form H_2O.

4. When they are exactly parallel they would not affect each other, provided they are of the same strength. When one is placed to the NW. of the other, both would be diverted, for the S. pole of one would be attracted by the N. pole of the other.

SOME RECENT QUESTIONS FOR REVISION.

Candidates—Geography.

1. Where are the chief industries of Wales carried on? Say what you can of them, and give the position of six large towns.
2. In what English, Scotch, and Irish counties are the linen, cotton, and woollen manufactures chiefly carried on? Say why such localities are suitable for the purpose.
3. Mention five holiday resorts in the British Isles, and say what points of interest a visitor would observe in each.
4. Draw a rough sketch-map of England south of the Thames and the Bristol Channel, indicating the ranges of hills, one of the chief railways from London to the provinces, with the principal towns through which it passes.
5. What circumstances favoured the establishment of the following industries at the place where they are found in the British Isles:—Manufacture of cotton goods, earthenware, cutlery, chemicals?
6. State briefly what you know of the Caledonian Canal, Belfast, Snowdon, Loch Lomond, and Perth.
7. Describe the Caledonian Canal, taking particular notice of its commercial value.
8. In a rough sketch-map of England and Wales mark in by circles the leading coalfields, and indicate the particular industries carried on in each.
9. Give some interesting information (in about four lines for each) about four of these:—Cambridge, Connemara, Dundee, Drogheda, and the Gap of Dunloe, Pass of Killiecrankie, Lichfield, Peterhead.
10. Write a short description of one of the following:—
    (*a*) A week's tour in the Highlands, *or* in the Lake District.
    (*b*) Edinburgh.
    (*c*) The Giant's Causeway.
11. What do you know of the North Sea and its fisheries?
12. Write four or five lines about each of the following:—
    (*a*) The Isle of Man.
    (*b*) The Wash.
    (*c*) The Isle of Skye.
    (*d*) Milford Haven.
13. Write an account of one of the following journeys:—
    (*a*) Liverpool to Southampton by sea.
    (*b*) From London to Newcastle by rail or cycle.
14. Name (*a*) the rivers on which Limerick, Newcastle, Stirling, Perth, Waterford, and Salisbury stand.
    (*b*) The highest mountains in Scotland, Wales, and Ireland.
    (*c*) The chief exports from Dundee, Belfast, and Newcastle.

First Year—Geography.

1. Russia may be divided into three great districts as regards its "natural productions." Say where these districts lie, and name the chief productions. What are the chief ports of each division?
2. Many rivers of India rise in the Western Ghats and flow eastward. Show that this statement is correct, and give reasons for the fact.
3. The products of Holland, Denmark, and the south of Ireland are somewhat alike. Name the chief things produced, and explain how the circumstances of these countries are suitable for their production.
4. Name two important groups of islands lying off the coast of Asia, and write fully about one of them.
5. Name the imports into Great Britain from Northern Europe, *or* from Southern Europe.
6. Draw a map of France, showing the leading physical features, the coalfields, and the great manufacturing centres.
7. Why does the water of the Mediterranean contain more salt than that of the Atlantic? What is its effect on the climate of the south of Europe?
8. Write a short account of Japan or of Persia.
9. Explain, by reference to the climate of the country, why it is desirable for Europeans to spend a portion of the year in one of the hill stations of India.
10. Describe the course of any two of the following:—Danube, Loire, Indus, Irrawaddy.
11. What rivers rise in the Alps? Briefly describe the course of two of them.
12. Give a short account of the commerce of British India.
13. Describe a voyage from Brindisi to Calcutta, mentioning the principal places of interest passed, and stating for what they are remarkable.
14. Name the "Six Great Powers of Europe," and distinguish between their several modes of government.
15. Write brief notes on *four* of the following:—Crete, the Riviera, Gallipoli, Hong-Kong, the Deccan, Aden.

Second Year—Geography.

1. Mention three or four occupations which an emigrant to Canada might follow. Say in what district each occupation is carried on, and describe the nature of the work.
2. Name the chief productions of (*a*) Tasmania, (*b*) Queensland, (*c*) South Australia. How are such productions brought to England, and what goods do we send in return?
3. Draw a map of that part of Australia which is included in the basin of the river Murray and its tributaries.
4. Give a short account of New Zealand, referring specially to its native race, its volcanic agency, and its suitability for English emigrants.
5. Account as fully as you can for the fertility and present importance of Egypt, and describe the position of Cairo, Port Said, Alexandria, and Khartoum.
6. Name four of the principal productions of the United States, and say what towns are specially interested in each product.
7. A great hindrance to progress in Africa is the difficulty of enlarging production. Show as carefully as you can how the difficulty is being removed.
8. Describe the animals, plants, and native inhabitants of Canada, *or* of Australia.
9. Write a full description of the mode of government of (*a*) the Dominion of Canada, *or* (*b*) Australia.
10. Describe the various products of Cape Colony, and give the position of the ports from which they are exported.
11. What do you know about the Gulf Stream?
12. Give a brief description of—
    (*a*) The Yellowstone Park, U.S.A., *or*
    (*b*) The Hot Lake District of New Zealand,
explaining the cause of the peculiar phenomena to be observed.
13. What was the origin of the Polynesian islands? Describe their inhabitants and products.
14. Describe the Canadian Pacific Railway. Show what its influence has been on trade and on the development of the country.

15. What are the exports of Natal, Newfoundland, Jamaica, and Sierra Leone?

Candidates—History.

1. When was the Act of Settlement passed? What provision was made for the succession to the throne of England?
2. When was Gibraltar taken? What great attempt was made to retake it, and with what success?
3. "About the middle of the eighteenth century the foundations of the English Empire in the West and East were finally secured." Explain this statement.
4. Name some important inventions of the present century.
5. Say what you can of three of the following:—Marlborough, Walpole, Nelson, Wilberforce, Dr. Johnson, Sir Walter Scott.
6. Explain the terms Witenagemote, Viking, Danelaw, Fyrd.
7. Give a short account of the reign of Alfred after the Peace of Wedmore.
8. What do you know of the Salisbury Decree, Assize of Arms, Magna Charta, Provisions of Oxford?
9. Say what you can of any three of the following:—Agricola, Canute, Hereward, Henry the First, Hubert Waller, Hubert de Burgh.
10. Tell the story of the Siege of Quebec, *or* the Charge of the Light Brigade at Balaklava.
11. What do you know of *two* of the following:—Flora Macdonald, Florence Nightingale, James Watt, George Stephenson?
12. Name three great geographical explorers in the eighteenth and nineteenth centuries, and briefly state what each of them has done.
13. Write a short life of Prince Albert.
14. What do you know about the Boston Tea Riots, *or* the agitation for the Abolition of Slavery? Mention any results of the one you select.
15. For what are the following persons famous:—William Wilberforce, Sir Robert Peel, Sir Henry Havelock?
16. Write a short account of the Indian Mutiny.

(See also Second Year.)

First Year—History.

1. What was the claim of Henry the Fourth to the throne? Why did the power of the Commons increase in his reign?
2. What were the causes of two of the following:—Statute of Labourers (1347 and 1562), Solemn League and Covenant (1643), Navigation Act (1651), Test Act (1673)?
3. When and with what results were three of the following battles fought:—Shrewsbury, Tewkesbury, Naseby, Drogheda (siege and storm), Worcester?
4. What do you know of any three of the following?—Duke of Bedford, Thomas Cromwell, Robert Blake, John Pym, Earl of Clarendon?
5. State, in chronological order, the main events of the reign of James the Second.
6. Explain the ground of Edward the First's interference in Scottish affairs; and say what you know of Wallace.
7. What foreign lands were ruled over by Henry the Second? Mention any that were lost by England before 1307, and say in whose reigns the losses occurred.
8. By what means did the English kings destroy the power of the feudal barons?
9. Tell the story of the quarrel between King John and the Pope.
10. Show how very similar were the causes which led to the deposition of Edward the Second and of Richard the Second, and how similar was the action of Parliament in each case.
11. What led to Jack Cade's rebellion? Give a short account of it.
12. Give a short account of the Spanish Armada.
13. State the causes which led to the execution of the Earl of Strafford.
14. Describe, shortly, Oliver Cromwell's relation with foreign powers.
15. Give some account of the chief reforms introduced by Henry the Second.
16. What were the effects of the Black Death on the social life of England?
17. Describe England's relations with other countries during the reign of Elizabeth.

Second Year—History.

1. What were the considerations which led to the Union with Scotland? What were the chief terms of the Act of Union?
2. What do you know of any three of the following:—Bolingbroke, Lord North, the *second* Pitt, Canning, Peel.
3. State briefly the course of events in Ireland in the reign of William the Third, *or* from 1780 to 1801.
4. How do you account for the distress in England after the battle of Waterloo? What were the Six Acts (1819)?
5. What events are connected with the following places (give dates):—Gibraltar, Plassey, Fontenoy, Majuba Hill, Prestonpans, Quebec?
6. What allies joined England in the Crimean War? Against whom was it fought? Name, in chronological order, the chief battles.
7. Describe shortly two wars in which England has been engaged during the last twenty years.
8. What was the Toleration Act, and when was it passed?
9. Give the main provisions of the treaty of Utrecht.
10. Say what you know about the Repeal of the Corn Laws.
11. Sketch the main incidents in the career of Robert Clive.
12. What allies did the revolted American colonies find, and with what objects and with what results did those allies join the Americans? Why did Canada remain loyal?
13. Give some account of the Reform Bill of 1832.
14. What was the Septennial Act of 1716?
15. Give a short account of the administration of Sir Robert Walpole.
16. What was the importance of the reign of William the Third in English history.
17. Give some account of the actions and aims of William Pitt the Younger.

(See also Candidates.)

AUTUMN EXAMINATION, 1900.

Seventh Month—April.

WORK TO BE PREPARED.

1. READING AND REPETITION.

Continued oral practice, with great attention to emphasis, modulation, enunciation, etc.

2. ENGLISH.

Candidates.—Marmion, Canto vi., lines 681 to 797.

First Year.—The Traveller, lines 297 to 334. Twenty roots and meanings each week. Derivations of all important words in the passage set for preparation.

Second Year.—Julius Cæsar, Act iii., Scene 3, to Act iv., Scene 3, line 120—"and leave you so." (*Notes*, see below.)

3. ESSAYS.

Write one or two essays each week, selecting from the following:—Description of any Ruin; Wages—why some Men receive more than others; The Habits and Mode of Life of any Wild Animal; The Coast of England; Difficulties a Pupil Teacher meets with; The Changes brought about by the Norman Conquest; Football; Your Favourite Recreation.

4. HISTORY.

Candidates.—James I. to the Restoration.
First Year.—The Wars of the Roses to 1485.
Second Year.—George I. and George II. (See *Notes* below.)

5. GEOGRAPHY.

Candidates.—The physical features of Scotland; its climate and productions.
First Year.—Siberia, China, Japan, and the Malay Peninsula.
Second Year.—The United States and Central America.

6. ARITHMETIC.

Candidates.—Problems in fractions and decimals.
First Year.—Percentages.
Second Year.—Square and cube root.

7. EUCLID.

First Year.—Props. 21–24, and four deductions each week.
Second Year.—Revise Props. 7–12, with eight deductions each week.

8. ALGEBRA.

First Year.—G.C.M. and L.C.M.
Second Year.—Quadratic equations.

9. MUSIC.

Work a set of questions weekly, and take regular exercise in practical work.

Notes on the Month's Work.

1. ENGLISH. (For full Notes, see November number 1899.)

2. HISTORY.

Candidates.—The Stuart period is one in which the great struggle between the King and Parliament for supreme power came to a head. It is very necessary, therefore, that the candidate trace carefully the gradual growth of the Commons, and especially of the Puritans. The Stuart theories of Divine Right, Dispensing Power, etc., must be noticed. The religious discontent is shown in James the First's reign in the various plots made against him. The Hampton Court Conference is important in that it led to the translation and issue of the Authorised Version of the Bible.

Charles had more determination than his father, and the disputes brought about a crisis. Note the three Parliaments, and especially the Petition of Right. Then followed eleven years of absolute rule, with the illegal methods of raising money. Lack of money caused the assembling of the Long Parliament; and the demands made on the King being more than he could grant, both sides had recourse to arms. For the Civil War a map of England should be prepared, all places mentioned inserted, a table of battles and their results drawn up and committed to memory.

The Protectorate is remarkable for the able rule of Cromwell, and for his vigorous foreign policy. The changes in the form of government between 1642 and 1660 should be carefully noticed.

When Cromwell died there was no able leader to unite all parties, and the nation at large was tired of the strict and sober rule of the Puritans; hence the Restoration, and the character of social life under the "Merry Monarch."

First Year.—The various battles, leaders, and results should be tabulated and learned. The results of the Wars of the Roses are most important—the breakdown of the Feudal System. Life of Warwick should also be prepared.

Second Year.—George the First. Chief events:—The Whig party in power. The Riot Act. The Rebellion of '15, and consequent passing of the Septennial Act lengthening duration of Parliament from three to seven years. The South Sea Bubble, and Walpole's remedies. Affairs in Ireland. Wood's Halfpence and the *Drapier Letters*.

George the Second. Walpole's able administration—a period of peace and prosperity. His Excise scheme. War with Spain. Pragmatic Sanction and War of the Austrian Succession. The '45. Reform of the Calendar. The Seven Years' War: Affairs in India—Clive at Plassey, Eyre Coote at Wandewash; affairs in America—Capture of Quebec.

Note the disasters of the early period of the war, and the great change which occurred when Pitt assumed office.

3. GEOGRAPHY.

Candidates.—Plenty of sketch-maps; all details which are to be remembered must be inserted and committed to memory.

First Year.—Note Russian extension of recent years in Turkestan and the Pamirs, the Trans-Siberian Railway, Russian policy in China.

China is attracting much attention amongst the European Powers at present. It is practically the only place where extension of territories can take place; it is densely populated, and therefore theoretically a good market for European produce. It seems to be breaking to pieces under misgovernment, and each nation is anxious to "grab." The Government has been forced to yield "leases" of places to foreign nations—for example, Port Arthur to Russia, Wei-hai-wei to Great Britain. Though nominally *leased*, these possessions will never revert to China.

Japan is also important; it has risen in power more rapidly than China has declined, and is a nation and a maritime power to be reckoned with. Note that it received in 1891 a constitution based very largely upon the English.

French and English interests in the Malay Peninsula are largely antagonistic, Siam acting to some extent as a "buffer" state.

Second Year.—The United States is set for special study, and therefore much care must be taken with its preparation. Sketch-maps must be drawn to illustrate everything. Much useful and interesting information may be obtained from geographical readers. Do not confuse Washington the state with Washington the capital, in the District of Columbia (eight miles square). The government is also important. Each state governs itself in all local matters, but they are all "federated" for national purposes—army, navy, coinage, postal system, etc. The difference between a territory and a state is that the former, not having sufficient population to govern itself, is controlled by the central government.

4. Arithmetic.

Candidates.—Any good text-book will contain a good selection of problems on fractions. The problems set in the examination require careful thought, and demand some intelligence in solution. A favourite form of question is, "If a man gives away $\frac{1}{4}$ of his money, then $\frac{2}{3}$ of the remainder, then $\frac{1}{2}$ of what then remains, and has 15s. left, what had he at first?"

These sums may be worked in two ways:—

(*a*) Let his original amount be 1.

1. If he gives away $\frac{1}{4}$, he has $\frac{3}{4}$ left.
2. He then gives away $\frac{2}{3}$ of $\frac{3}{4}$, and has $\frac{1}{3}$ of $\frac{3}{4}$ or $\frac{1}{4}$ left.
3. He then gives away $\frac{1}{2}$ of $\frac{1}{4}$, and has $\frac{1}{2}$ of $\frac{1}{4}$ or $\frac{1}{8}$ left.

$\frac{1}{8}$ of the money = 15s.
$\frac{1}{4}$ of the money = 5s.
$\frac{8}{8}$ of the money = 80s.

Or (*b*), working backwards from the result,—

1. 15s. is $\frac{1}{2}$ of the last amount, ∴ the total was 20s.
2. 20s. is $\frac{1}{3}$ of the next amount, ∴ the total was 60s.
3. 60s. is $\frac{3}{4}$ of the original amount, ∴ the total was 80s.

The last method is preferable where anything beyond fractions is introduced. For example, A woman gave away $\frac{1}{4}$ of a number of eggs *and 1*, then $\frac{1}{3}$ of the remainder, then $\frac{1}{2}$ of what then remained, and had 15 left: how many had she at first?

Reasoning backwards,—

1. She had 15 left after giving away $\frac{1}{2}$, ∴ she had 30 before.
2. 30 remained after giving away $\frac{1}{3}$, ∴ 30 = $\frac{2}{3}$ of second number, which = 45.
3. 45 is $\frac{3}{4}$ of the original number all but one.

∴ 46 is $\frac{4}{4}$ of the original number, which is 60.

First Year.—Percentages are only particular cases of simple proportion. Remember in all cases to take cost price as 100, and calculate loss or gain *per cent.* The most *frequent* error is to omit the *per cent.* For example, A buys a horse for £100, and sells to gain 10 % to B. B sells to gain 20 % to C, and C sells to gain 25 %. It is *wrong* to say the gain is 10 + 20 + 25 = £55; for if A buys at £100, and sells at 10 *per cent.* more, he sells to B for £110. B sells for £110 + 20 per cent. of £110 = £132. C sells for £132 + 25 per cent. of £132 = £165. ∴ total gain is £65.

Another common form of question is: "A man wishes to insure a ship worth £9500 at 5 %, so that in case of loss he may recover both the value of the ship and his insurance: what must he insure for?"

In a case like this it must be remembered that every £5 paid for insurance means £100 returned. If this is to cover insurance, £100 must be reckoned as the amount £95 worth of goods is insured for. Therefore state—

Sum insured to get £95 = £100.

Sum insured to get £1 = £$\frac{100}{95}$.

Sum insured to get £9500 = £$\frac{100 \times 9500}{95}$ = £10,000.

This is evidently correct: for on £10,000 he would pay £500 premium; and if the ship were lost, he would get £9500 (value of the ship), and £500 (amount paid for interest).

5. Algebra.

The G.C.M. and L.C.M. must be worked by *factors*. In finding the factors of such an expression as $x^3 + 8x^2 + 13x + 6$, it is useful to notice that it must be produced by *three* terms multiplied by *two*, and that the two-term expression must be $x + 1$, $x + 6$, $x + 3$, $x + 2$. These can be tested. But since the sum of the coefficients of odd powers = sum of coefficients of even powers, it is divisible by $x + 1$. If the numbers came the same, but with different signs, it would be divisible by $(x - 1)$.

$$x^3 + 8x^2 + 13x + 6 = (x + 1)(x^2 + 7x + 6)$$
$$= (x + 1)(x + 6)(x + 1).$$

6. Teaching.

All pupil teachers should take regular practice in writing on the blackboard, as prescribed in the syllabus. (Use the *Practical Teacher Copy Book* as a model.)

Test Questions.

1. *Penmanship.*

Large Hand:—*Undenominational.*
Small Hand:—"*We are such stuff as dreams are made of.*"

English.

2. *Candidates.*—Analyse and parse words in italics:—

"'Stint in thy prate,' *quoth* Blount; '*thou'dst best*,
And listen to our lord's behest.'"
"And *not* a *moment* will he *bide*
Till squire or groom before him *ride*."

First Year.—Paraphrase lines 255–266, *The Traveller.*

Analyse lines 277–280.

Parse:—"Till, seeming blest, they grow to what they seem."

Second Year.—Paraphrase (*Julius Cæsar*):—

"Good friends, sweet friends.....
.....to rise and mutiny."

Analyse:—"I am no orator.....
.....which you yourselves do know."

Parse:—"And none so poor to do him reverence."

3. *Candidates.*

(*a*) Say what you can of the plots against Henry the Seventh.
(*b*) What do you know of the Reformation in England?
(*c*) Write a life of Mary Queen of Scots.

First Year.

(*a*) What revolts were there in Henry the Fourth's reign?
(*b*) Give an account of Henry the Fifth's campaign in France.
(*c*) How do you account for the loss of the French provinces in Henry the Sixth's reign?

Second Year.

(*a*) What was William's foreign policy?
(*b*) Give the causes and results of the War of the Spanish Succession.
(*c*) Say what you can of social life in the time of Queen Anne.

4. *Candidates.*

(*a*) Give an account of the physical features of Wales.
(*b*) What do you know of Cardiff, Penryn, Lake Bala, Welshpool, Llandaff, and Anglesey?

First Year.

(*a*) Describe the mountain system of Asia.
(*b*) Give an account of the chief vegetable productions of (*a*) Siberia, (*b*) India.

Second Year.

(*a*) Describe a journey across America by the Canadian Pacific Railway.
(*b*) What do you understand by the term "Dominion of Canada"? How is the Dominion governed?

SCHOLARSHIP EXAMINATION, 1900.

Fourth Month—April.

Work to be Prepared.

1. *Reading, Repetition, and Penmanship.*—A few minutes' daily practice.

2. *Theory of Teaching.*—Chaps. v. and vi., *Scholarship School Management.*

3. *Geography.*

(1.) Revise Holland, Belgium, Denmark, and Scandinavia.
(2.) Australia: industries, people, government, and towns.

4. *History.*—Henry IV. to Richard III. inclusive.

5. *Composition.*—One or two essays each week on such subjects as—Modern Weapons of Warfare, Australian Federation, John Ruskin and his Work, The Indian Famine, The Greatness of Shakespeare, Division of Labour, The First House of Commons.

6. *English.*

(1.) The grammar and syntax of the verb.
(2.) Twenty roots and meanings each week.
(3.) The history of the language to 1700.
(4.) *Julius Cæsar*, Act iii., Scene i.

7. *Arithmetic.*—Percentages, average, commission, etc.

8. *Algebra.*—Quadratic equations.

9. *Euclid.*—Book I., Props. 31–40, and six deductions per week.

10. *Elementary Science.*—Elementary chemistry: mixtures and compounds. Water: its composition proved by analysis and synthesis; its physical properties. Elementary properties of oxygen, nitrogen, hydrogen, carbon, iron and mercury, water, carbon dioxide, lime, silica, and the alkalis, common salt, iron oxide, and mercuric oxide.

11. *Languages.*

Latin, *Pliny's Letters*, No. 5. } Translation and retranslation.
French, *Le Trésor*, three pages. } Exercises in grammar.

12. *Drawing.*—A freehand copy each week. Geometry: proportional lines. (Students are advised to take *The Practical Teacher's Art Monthly*, which will give them much assistance on this subject.)

13. *Music.*—Chap. iv., *School Music Teacher.*

14. *Domestic Economy.*—Clothing and washing: materials

used—manufacture, relative value, cost and durability, care and preservation. Cost of outfits. Materials used in washing, and their chemical action. Methods of washing common articles.

Notes on the Work for the Month.

Geography.—The Federation of Australian Colonies is a topic now prominently before the public. The following are brief notes on the history of the movement:—

1883. A conference was held of delegates from all the colonies to discuss matters of common interest.
1885. A Federal Council of Australasia was formed, representing Victoria, Queensland, Western Australia, and Tasmania. This council could only debate matters, and advise the various governments. It had no power to enforce its recommendations.
1887. A council was held to adopt a scheme of national defence.
1891. The Sydney Convention drew up a draft Bill; but little action followed. Councils were again held at Hobart ('95), Adelaide ('97), Sydney ('97), Melbourne ('98), and a draft measure proposed.
1898. A referendum to the electorate led to Victoria, South Australia, and Tasmania accepting this measure. New South Wales refused at first, but afterwards accepted.
1900. A Bill is to be brought forward in the British Parliament to enable the above colonies to federate under the title, The Commonwealth of Australia. If passed, the Act comes into operation in 1901.

History.—Chief Points:—

Henry IV.—(*a*) Genealogical table showing claim.
(*b*) Revolts (four).
(*c*) The Lollards.
Henry V.—(*a*) The French War.
Henry VI.—(*a*) Minority; (*b*) War in France; (*c*) Jack Cade's Rebellion; (*d*) Wars of the Roses—the rival claimants, events leading up to outbreak of hostilities, chief battles, etc.
Edward IV.—The King-maker; Edward's character; "Benevolences."
Richard III.—Means of obtaining crown; Buckingham's Rebellion; Battle of Bosworth.

Note the following:—

The Wars of the Roses—their character and result.

It is a common mistake to suppose that the whole of the nation was involved in these sanguinary contests. The war was carried on by the great barons and their armed retainers, and the common people of the country pursued their usual avocations, but with more interruption, perhaps, than would have been the case in time of peace. The results briefly were:—

(*a*) The final extinction of the Feudal System. The loss of life among the barons and their retainers was enormous, and practically exterminated the powerful houses, which had kept up semi-regal state. One feature of the struggle which is most terrible is the ferocity with which both parties took revenge for the deaths of kinsfolk. This introduction of personal feud into a political contest accounts for the fierce fights and great loss of life.
(*b*) The growth of commercial prosperity and enterprise. The great towns benefited from the contest by obtaining concessions from both parties.
(*c*) The rise of a new nobility.

This period is the closing scene of the "Middle" or "Dark Ages." With it a new era of intellect and mental ability, as opposed to physical strength, dawns.

Learn the following note:—

Advances of the Constitution under the Lancastrians and Yorkists.—As the House of Lancaster reigned solely by the choice of the people and the sanction of Parliament, they seldom, if ever, ventured openly to resist the powers of the Commons, who took advantage of the circumstances to make many advances, the chief of which were:—

1. They maintained and completely established their exclusive right of taxation.
2. They controlled public expenditure, voted their supplies for special purposes, and saw that they were properly spent.
3. They made supplies depend upon redress of grievances.
4. They controlled the king's household expenditure.
5. They established more fully the fact that laws can only be made by the consent of King, Lords, and Commons.
6. They began to give advice on matters of foreign policy.
7. They maintained the right to impeach bad ministers, to freedom of speech, and freedom from arrest.

English.—The grammar of the verb requires careful attention. Note particularly the moods, gerund, defective verbs, concord of verb with subject. The period of English set is a most interesting one, more from a literary than from an etymological point of view. Students should know something of the chief writers and their works.

In the *Cæsar* set, send up all difficulties for solution.

Arithmetic.—See note on Percentages above.

Test Questions.

1. Write a specimen of copy setting.
(*a*) Large Hand:—*Hieroglyphics.*
(*b*) Small Hand:—*Not wholly in the busy world, nor quite Beyond it, blooms the garden that I love.*

2. What do you know of Caxton? Point out the importance of the introduction of printing.

3. Write out a classification of pronouns, and add notes on any peculiarities of the Indefinite Pronouns.

4. What do you know of the fauna and flora of Australia? How are Australian products brought to England?

5. Enumerate some of the legal reforms of Edward the First and Edward the Third.

6. Trace the causes of the villeins' revolt, and point out the chief results. Why did the rebels attack lawyers, and burn all documents found?

7. What kind of apparatus would be needed for a lesson on the seasons? and show how you would use it.

8. Compare, as articles of food, fish, rabbit, beef, and pork.

9. Which are the most useful vegetables in common use? What is the particular value of *green* vegetables as an article of diet?

10. Work the following test paper in decimals:—
(*a*) In what sense can $\cdot\dot{9}$ be said to be equal to 1?
(*b*) What vulgar fractions can be expressed by finite decimals, and why?
(*c*) Prove the rule for converting recurring decimals into vulgar fractions.
(*d*) Express in its simplest form $\dfrac{1\cdot\dot{5}47\dot{8} \times 10\cdot618}{2\cdot\dot{6}54\dot{7}}$.
Ans. 6·19.
(*e*) Divide $\dfrac{\cdot052}{1\cdot3}$ of 1·56 by $\dfrac{\cdot0624}{14\cdot4}$ of 25·92.
Ans. ·5.
(*f*) Find the value of $(\frac{1}{4} + \frac{2}{5})$ of 4 guineas + $(\cdot0\dot{9} - \cdot\dot{0}\dot{1})$ of £2, 1s. 3d. + $(5\cdot05 \div \cdot005)$ of 5s.
Ans. £257, 2s. 2½d.
(*g*) A's share is $\cdot\dot{0}\dot{9}$ of B's, B's is 3·08 of C's, C's is 1·1 of D's. C's share is £2750. Find A's, B's, and D's.
Ans. A = £770, B = £8470, D = £2500.
(*h*) Five bells which commence tolling together toll at intervals of 1·2, 1·5, 1·75, 1·8, 2·1 seconds respectively; at what intervals will they all toll together?
Ans. 126 seconds.
(*i*) Simplify $\dfrac{8\cdot\dot{5}71428 \times 1\cdot7}{2\frac{1}{7} \text{ of } 1\cdot\dot{2}85714} \times \dfrac{\cdot21\dot{6} \text{ of } \cdot625}{\cdot48}$.
Ans. $1\cdot22974537\dot{0}$.

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

Muzhik.—As far as fluency goes, your composition is good; but the evident desire to introduce long words where simpler ones would do better is far from commendable. The ideas are, for the most part, utter nonsense. It is always well, in dealing with such a question, to allow that those holding adverse views, especially when they are some of the eminent statesmen and jurists of the day, know at least as much about the question as a pupil teacher. Abuse and sarcasm are not argument. Opinions are worthless unless they are the result of logical reasoning from facts; and of facts you have few. Take Ruskin's advice, "Go over your essay, and cut out everything of which you are proud," and its value will be enhanced.

H.S.—I will deal with your query later on.

T.H.—Longmans have just published the book you want.

(*Other correspondents answered by post.*)

The Practical Teacher's Scholarship Series.

THE METHODIC MEMORY MAP BOOK.
For Pupil Teachers and Scholarship Students.
By A. T. FLUX, Author of "Scholarship and Pupil Teachers' School Management," etc., etc.
Easy to memorise, and easy to reproduce. Price 1s.

THE PRACTICAL TEACHER'S COPY BOOK.
By A. T. FLUX. Price 1s.

Special Features:—The ONLY Book for Pupil Teachers, Scholarship and Certificate Students. Fifty per cent. to one hundred per cent. increase in marks by using it. Natural slope. Simple formation of letters combined with clearness and beauty of form. Easily and rapidly produced. Regular practice afforded in Large and Small Hand. Definite rules as to size of writing and letters, etc. Special classification and practice of difficulties. Copious copies. Facsimile ruling to Examination Papers. Latest Government Tests.

T. NELSON AND SONS, LONDON, EDINBURGH, AND NEW YORK.

OUR CERTIFICATE COURSE FOR 1900.

BY GEORGE COLLAR, B.A., B.SC.,
Head-Master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON THE MARCH WORK.

THEORY OF TEACHING.

FIRST YEAR.—1. Show how the introductory lessons in geography given to a town child should differ from those given to a country child.

2. Give instances of the way in which children should be taught to associate cause and effect in geography.

SECOND YEAR.—What is apperception? Of what stages do the Herbartians recommend that a lesson should consist?

ARITHMETIC.

1. If the true discount on a certain sum for a certain time is £25, what would be the true discount on three times the sum for twice the time, the rate of interest being the same in both cases?

2. Why is the *simple interest* on a sum proportional, but the *amount* not proportional, to the time?

ENGLISH.

FIRST YEAR.—1. Describe the chief ways in which modern English adverbs have been formed.

2. Give a summary of Johnson's criticisms on *Lycidas*. How far do you consider them just?

SECOND YEAR.—1. Give a summary of Leigh Hunt's *Tale for a Chimney Corner*.

2. Give examples of Latin constructions employed by Milton in the first book of *Paradise Lost*.

GEOGRAPHY.

BOTH YEARS.—1. In what ways are the physical features of Switzerland sources of wealth to its inhabitants?

2. Describe the mountain system of the western part of the Austro-Hungarian dominions.

HISTORY.

BOTH YEARS.—1. Give the causes of the American War of Independence. What lessons were learned from it in the matter of colonial government?

2. Trace the course of the fighting, and show the influence of sea-power on the result.

ALGEBRA.

WOMEN.—1. Simplify $\dfrac{xy(a^2+b^2)+ab(x^2+y^2)}{xy(a^2-b^2)+ab(x^2-y^2)}$.

2. Factorise $(x-y)^2a^2+2(x^2-y^2)ab+(x+y)^2b^2$.

MEN—FIRST YEAR.—1. If α and β are the roots of the equation $x^2+px+q=0$, form the equation whose roots are α^4 and β^4.

2. Solve—
$$\begin{cases} x^2+(y-z)^2=a. \\ y^2+(z-x)^2=b. \\ z^2+(x-y)^2=c. \end{cases}$$

MEN—SECOND YEAR.—1. Find the amount of £600 placed out at 4 per cent. compound interest for 15 years.

2. At what rate per cent. will £4575, 15s. amount to £6800 at compound interest in 9 years?

EUCLID.

WOMEN—FIRST YEAR.—Prove I. 17 without producing a side.

WOMEN—SECOND YEAR.—Show that the squares on two sides of any triangle are together double of the squares on half the third side, and on the straight line joining the middle point of the third side to the opposite angle.

MEN—FIRST YEAR.—Divide a triangle into two equal areas by a straight line passing through any point given in one of the sides.

MEN—SECOND YEAR.—Show that the mean proportional between two given straight lines is less than half their sum. Give the algebraical statement corresponding with this.

FRENCH.

FIRST YEAR.—1. Form adverbs of manner from: *heureux, gai, triste, fier, aveugle, récent, instant.*

2. Give, with examples, the rule for the place of adverbs.

3. Write out a translation of the first forty lines of *Le Voyage*, chap. x.: *Le dîner était prêt.....le plus grand plaisir.*

SECOND YEAR.—1. What is the difference between *par ce que* and *parce que; quoi que* and *quoique;* and between *quand* and *quant à?*

2. Translate *Le Roi des Montagnes*, page 120, line 31, to page 121, line 35. *Il paraît.....au moins deux ou trois.*

SYLLABUS AND NOTES FOR APRIL.

ENGLISH COMPOSITION.

Write essays on:—

1. Self-help.

2. "How oft the sight of means to do ill deeds makes ill deeds done!"

3. The importance of order and method.

THEORY OF TEACHING.

FIRST YEAR.—*The teaching of history.* Reasons for teaching history—principally as a means of training the child's imagination. A course of history for children cannot do much in the way of training other faculties; they are not sufficiently matured to be relied on when called into action. History lessons also supply material which makes general reading so much more interesting and profitable. History, when properly taught, leads to an enlightened and chastened patriotism, which makes the pupil proud of his own country, but considerate towards foreigners; and it enables the pupil to arrive at a more intelligent understanding of present-day institutions, under which he lives and in which he will some day have to take part. It will be found that history does little to help the child to form opinions of his own; he generally adopts those of his teacher. A great deal of moral instruction may be brought in through the historical biographies.

Logic.—Jevons, xix.–xxi. Conditional arguments. Notice particularly the double condition or dilemma. The classification of fallacies is of importance, as it enables the student the more readily to expose the fallacy in an argument. Observe the difference between an *equivocation* or logical fallacy and the use of the same name to denote a falsehood.

SECOND YEAR.—*Psychology.* Instincts and emotions. The former are tendencies to produce certain definite acts, and the latter are tendencies to produce certain definite feelings, resulting in both cases from surrounding circumstances. Instincts, no doubt, have their origin, like the physical powers of animals, in the great struggle for existence which is going on; in many cases the two were, no doubt, evolved simultaneously—for example, the swimming instinct and the webbed feet of the duck. In all cases the instinct tends to the preservation of the race, just as the development of an organ of the body does. The teacher is more concerned with the emotions than with the instincts, as he may regard the former as so many levers which he can use in his work. The emotions may be roughly classified as (*a*) the coarser passions—such as anger, joy, love, pride, etc.; (*b*) the subtle emotions—such as the moral, religious, and æsthetic feelings. It is impossible to draw a line between one feeling and another allied to it. (See Pope's *Essay on Man*, Ep. II., lines 93–100.) We must refer our readers to the excellent chapter on this subject in James's *Psychology*, chap. xxiv., in which he contends that the emotions are the result of bodily conditions assumed, and not *vice versâ:* thus we feel afraid because we run away—we do not run away because we feel afraid; so we feel miserable when walking through a drizzling rain, *because* we crouch down under an umbrella, and do not crouch because we feel miserable and depressed. The chief objection to this theory lies in its failure to explain a change of state: thus a soldier may fearlessly face his foe, or a lamb may face a wolf, for some time and then run off in a state of terror. Now it seems difficult to account for the change of bodily condition and position unless the emotion of fear is antecedent to the movement.

School Management.—Records of progress required by Code and Instructions to Inspectors.

ARITHMETIC.

Study the theory and practice of compound interest. Be careful always to read the question, and if asked for the compound interest for four years, do not give as your answer the interest for the fourth year, nor the amount for four years. Always work by means of decimals of a pound, and unless especially told to bring out the result with absolute accuracy, rest content with a *result correct to three places.* To secure this, four places may be used in the working, but all digits beyond the fourth should be struck out as soon as they appear. The third digit will give the result correct to the nearest thousandth of a pound—that is,

nearer than the nearest farthing (which is £$_{0}\frac{1}{48}$)—while in practice bankers take no notice of fractions of a penny. The ordinary methods of arithmetic are available for finding the compound interest for a few years only. Students are, however, recommended to see how, by means of logarithms, the compound interest for a long period may be found as easily as for a short one. Even without logarithms, a knowledge of indices will enable many questions to be solved by means of the formula $A = P\left(1 + \frac{R}{100}\right)^n$ which could hardly be solved without it.

Example.—If £750 amount at compound interest to £1410 in 18 years, to what would it amount in 36 years?

Applying the formula to the first part of the question, we see that

$$1410 = 750 \times \left(1 \times \frac{R}{100}\right)^{18}.$$

$$\therefore \left(1 + \frac{R}{100}\right)^{18} = \frac{1410}{750} = \frac{141}{75}.$$

We could extract the 18th root of this quantity and find the value of $1 + \frac{R}{100}$, and hence the value of R, but this is not required. For the second part the formula gives

$$A = 750 \times \left(1 + \frac{R}{100}\right)^{36};$$

and since $\left(1 + \frac{R}{100}\right)^{36}$ is the square of $\left(1 + \frac{R}{100}\right)^{18}$, we can square the value of the latter quantity, as determined above, and we obtain

$$A = 750 \times \frac{141}{75} \times \frac{141}{75}$$

$$= \frac{\overset{47}{\cancel{141}} \times 141 \times 2}{\underset{5}{\cancel{75}}} = \frac{13254}{5}.$$

Ans. £2650, 16s.

A question similar to the above was recently set at the Certificate Examination.

English.

First Year.—Compound words. The student should study Nesfield, Part III., chaps. xxvii.–xxxi. The first and last of these chapters should be studied with very great care. The comparative results in chap. xxxi. will be especially useful, and are well arranged, so as to present the subject-matter in a form which is easily grasped.

Revise the *Essay on Man*, Book I.; send up any difficulties not covered by our notes in August, September, and October last. Search for and learn up derivations of words in Book I., with the help of a good etymological dictionary, such as Skeats's.

Second Year.—Read through *The Tempest* again at leisure; *Paradise Lost*, Book II., lines 1–505.

2. *Ormus* or Ormuz. An island and town in the Strait of Ormuz; formerly the centre of Persian trade. *Ind* = India.

13. *I give not* = I give not up.

17. *Trust.....second fate.* Having fallen so low, they could fall no further; but if any change took place, they must gain by it.

40. *By what best way*, etc. We now debate which is the best way.

47. *Rather.....at all.* He preferred annihilation to being less strong than the Eternal.

52. *Unexpert* = lacking experience in.

69. *Tartarean.* Pertaining to Tartarus, which was the part of the infernal regions in which the wicked were punished.

73. *The sleepy drench of that forgetful lake* = The sleep-producing immersion in that lethal lake. Moloch implies that the lake of fire into which the rebel angels had been cast may have caused them to forget everything, as the river Lethe was said by the ancients to do.

75. *Proper motion.* The motion due to our own inherent nature. People ignorant of those mechanical principles which cause heated air, etc., to expand and rise considered that it was a natural property of fire to rise. (Compare "Man is born to sorrow, as the sparks fly upward.")

81. *The ascent is easy.* This is an inversion of the well-known classical saying, "*Facilis est descensus Averni.*"

91. *Inexorably.* Without any possibility of remission through prayer. Lat. *orare*, to pray.

94. *Incense.* To kindle: notice that the whole passage is a metaphor. Divine anger is compared to a fire which may consume and reduce to nothing those who kindle it.

97. *Happier far.....being.* We should be far happier if our being (essential) were reduced to nothing, than being miserable to exist for ever.

113. *Manna.* A symbol not only of sweetness, but of mystery. It is a Hebrew word, meaning "What is it?"

142. *Our final hope is flat despair.* Notice the paradox.

153. *Can give it* = can grant it—that is, relief from pain by means of annihilation.

165. *Strook.* The old past participle of *strike*.

172. *Or from above.....us.* Paraphrase: Or what if vengeance, which for a time has been still, should again arm his red right hand to plague us from above?

177. *Impendent* = impending, hanging over, threatening us.

224. *For happy .....worst.* Though only ill when compared with happy lots, yet not the worst when compared with the ill ones. This use of *for* (= when compared with) is an imitation of the Latin use of *pro*.

241. *To celebrate.* To go to in throngs; hence, to honour.

244. *Sovran.* Modern form = *sovereign*; it is from the Low Latin *superanus*, one above, and has nothing to do with the verb "reign."

245. *Ambrosial.* Connected with the "immortals." The food of the gods was called *ambrosia*.

249. *To whom* = to Him whom.

278. *The sensible of pain* = the sensibility to pain.

281. *With regard.....where* = having regard to what we are and where we are.

292. *Another field.* Another battlefield.

302. *Front* = forehead.

306. *Atlantean.* Like those of Atlas, who was fabled to carry the world on his shoulders.

330. *Determine us* = bring us to an end. Lat. *terminus*.

332. *Voutsafed* = vouchsafed, guaranteed to be safe.

386. *Infernal states.* The deliberative assembly of the lower regions.

396. *We may chance re-enter.* We may consider *chance* as an adverb (= perchance), or take it as a verb, in which case re-enter = to re-enter.

406. *Palpable obscure* = darkness that may be felt.

407. *Uncouth* = unknown. From the past participle of A.S. verb, *cunnan*, to know.

409. *Arrive.* Not now used transitively. Though now used in speaking of any journey, it formerly referred only to journeys by water. (Lat. *ad*, to; and *ripas*, the banks.) An inverse change has occurred in the meaning of *voyage*.

412. *Senteries.* Literally, guards who walk along a path. (Lat. *sentis*, a path.)

416. *Relies.* Lies or rests; the prefix has no force.

417. *This said.* Nominative absolute. (See grammar book.)

418. *Suspense.* Here an adjective = suspended, or in suspense.

432. Contrast with line 81.

439. *Unessential.* Having no essence or being. (Lat. *esse*, to be.)

443. *Him* = to him, for him.

469–70. Others might offer for the sake of gaining credit for making the offer, well knowing all the time that they ran no risk of their offer being accepted.

478. *Prone* = with face downwards; the opposite is "supine."

484. *Specious.* Showy. (Lat. *species*, an appearance.)

490. *Louring.* Also spelt "lowering," but must not be confused with the word to let down; it means "frowning," and is related to "leer."

491. *Landskip.* Landscape: from the Dutch. The suffix *-skip* (modern *-scape*) is the equivalent of *-ship*, in friendship.

492. *Chance.* See note on line 396.

History.

Both Years.—Study the Parliamentary troubles in Ireland. Poynings's Law, passed under the Lord-Deputyship of Sir Edward Poynings as far back as 1494, declared that (*a*) the Irish were bound by all laws passed by the English Parliament; and (*b*) that the Irish Parliament could pass no laws which had not first been approved by the English Privy Council. These were repealed in 1782, but still the facts remained that only Protestants had the Parliamentary franchise in Ireland, and that the Irish Executive was responsible, not to the Irish Parliament, but, through the Lord-Lieutenant, to the English Government. Get up the affairs of India under George the Third; and in this connection read Macaulay's Essays on Clive and on Warren Hastings; the former you are fairly familiar with from having studied it as a pupil teacher. We have dealt already with the main part of Clive's career. In 1765 he was sent to India, to reform certain abuses arising from the malpractices of the Company's servants, whose pay he increased, and whom he forbade to carry on trade on their own account. He also obtained a formal recognition from the Great Mogul of the position that the English then occupied in actual fact in India.

Hastings continued Clive's policy by supporting the Nabob of Oude against the Mahrattas, and lending him troops to annex Rohilcund. Regulating Act, 1773, created a council which thwarted Hastings in every way, and entertained a false charge of bribery against him. Trace the course of the conflict with the Mahrattas, and notice how the expenses were met. Notice the efforts of the Coalition Ministry in 1783 to deal with Indian affairs, and also Pitt's India Bill, 1784.

Geography (Both Years).

Austria-Hungary (continued). The *commerce* of Hungary is necessarily, for the most part, an overland one; the free ports of Trieste and Fiume have, however, considerable trade with Mediterranean ports and Great Britain.

The foreign overland trade is chiefly with Germany, and to a less extent with Switzerland, Italy, Roumania, and Russia. The railway system brings the country into communication with all the states of Europe—the Alps, Carpathians, and Balkans all being crossed by lines.

The home trade is very great, the Danube with its tributaries being the chief highway; there is a brisk exchange between the raw materials and food-stuffs of the south and east and the manufactured goods, textile and metal, of the north and west. Study chief exports and imports.

In studying the means of communication, note that the railways are highly important; that the Danube is the great commercial waterway; that canals are little developed.

The *people* of Austria-Hungary belong to four chief races—Slavonic, Teutonic, Romanic, Magyar.

The *Slavs*, typically a slow and slovenly people, include Czechs (of Bohemia, the most educated section), Poles, and Ruthens, of the north; Wends, Croats, and Serbs in the south: generally the southern Slavs are less cultivated than those of the north.

The Bohemians (Czechs), aspiring to form an independent Slav kingdom, hate their German and Jewish fellow-citizens, and are kept subjects of the Austrian crown by force.

The *Teutons*, or Germans, occupy the west of the country, Upper and Lower Austria, Styria, Carinthia, and much of the Tyrol.

The *Romanic* peoples include Italians, who inhabit the southern valleys of the Tyrol, and Rumanians, who inhabit a large part of Transylvania.

The *Magyars*, or Hungarians, whose language resembles that of the Finns, and who probably belong to the Yellow type, are a proud, independent people occupying Hungary.

Besides these four chief races, there are many Jews (the despised Semitic Jews swarming in the east), gipsies, Armenians, Albanians, and Greeks.

Study a map showing the Austrian or Cis-Leithan Provinces, and Hungarian or Trans-Leithan; note the dominant people in each; note also that the Austrian provinces, inhabited by the most energetic and educated people, Germans and Czechs, are the *industrial* ones; while in the Hungarian provinces *agriculture* is the chief and often the only occupation of the people.

Study the geography of the most important towns.

This ends the second division of Europe—namely, south-west and central. The student is recommended to revise the geography of south-west Europe (Iberian Peninsula, France), and as much of Central Europe as time permits.

The countries in Southern Europe are Italy and the Balkan Peninsula.

Italy. The map is familiar to all. A sketch-map including the neighbouring islands should be drawn; and the most important coast features marked, position, boundaries, area, etc., studied. It is convenient in studying the geography of the country to use the natural divisions of (*a*) continental, (*b*) peninsular Italy—each having its characteristic features.

Continental Italy is a wide, fertile plain, bounded on the west and north by the Alps (which divide the country from France, Switzerland, and Austria-Hungary), and drained by the Po and its tributaries.

This plain is the great Plain of Lombardy, which is both the great agricultural and the great manufacturing part of Italy. Cereals, rice, olive oil, poultry, eggs, cheese, are important products, and the silks and velvets of Turin and Genoa rival those of France.

Some of the wealthiest Italian cities—Milan, Bologna, Turin, Verona—occur in the plain.

The plain has been the scene of many a battle, and is studded with fortified places; note especially Mantua, Peschiera, Verona, Legnago, the famous "Quadrilateral."

In the north are many lakes, as Maggiore, Como, Garda.

The commerce of the plain is great, passing out seaward, through Genoa and Venice, though the latter is noted now rather for beauty and position than for trade; and overland by Alpine tunnels and passes into France and Switzerland.

Note the chief railways, especially those through Mont Cenis and St. Gothard tunnels; note also the great Æmilian road from Rimini on the coast, through Modena, Reggio, Parma, to Piacenza: the last-named is the terminus of the great road, because it is the lowest point at which the river Po can be bridged, inasmuch as it is here that the river banks begin to be marshy.

Note the delta of the river: the land is being pushed out into the Adriatic, as is evidenced by the fact that the old ports of Adria (which gave its name to the Adriatic) and Ravenna are now some miles inland.

Algebra.

Women—Both Years.—Problems to be solved by equations involving more than one unknown.

Men—First Year.—Problems. Arithmetical and geometrical progressions.

Men—Second Year.—Scales of notation.

Euclid.

Women—First Year.—Revise to end of Prop. 38, with exercises.

Women—Second Year.—Tabulate the enunciations of theorems in Book I., according to whether they prove equality of lines, equality of areas, etc., and work deductions on Book I.

Men—First Year.—Revise Book II.; express the enunciations algebraically, and work as many deductions on the book as you can get hold of.

Men—Second Year.—To end of VI. 19, with exercises.

Latin.

See The Practical Teacher Matriculation Course.

French.

First Year.—Practise unseen translation. Revise articles, nouns, and adjectives. *Le Voyage*, chaps. xiii.–xxiv.

Second Year.—Practise unseen translation, as well as retranslation of passages from the author.

Le Roi des Montagnes, pp. 132–155. Practical Teacher edition, with Exercises xvii., xviii.

YORK CONFERENCE PROGRAMME.

Saturday, April 14th—

11 a.m. to 7.30 p.m.—Reception by the Local Conference Committee in the Exhibition Buildings.

Monday, April 16th—

1 p.m.—First Session (Public).
4.15 p.m.—Annual Meeting of the Teachers' Provident Society in the Co-operative Hall.
5.30 p.m.—Annual Meeting of subscribers to the Benevolent and Orphan Funds in the Conference Hall.
—— p.m.—Annual Meeting of the Federation of Assistant Teachers in the Reckitt Street School, Clifford Street.
—— p.m.—Annual Meeting of the Federation of Rural Teachers (place not fixed).
—— p.m.—College Reunions.
8.30 p.m.—Ladies' "At Home" in the Central Hall, Exhibition Buildings.

Tuesday, April 17th—

8 a.m.—National Temperance League (Breakfast).
10 a.m.—Second Session (Public).
2 p.m.—Third Session (Private).
7.30 p.m.—Lord Mayor's Reception at the Mansion House.

Wednesday, April 18th—

9.30 a.m.—Fourth Session (Public).
2 p.m.—Fifth Session (Private).
3 p.m.—Visit to Bishopthorpe—Palace and Grounds.
3 p.m.—Football Match in aid of the Charities. Final Tie—Schoolboys' Yorkshire Association Championship.
7 p.m.—Conference Dinner.
8 p.m.—Grand Concert in the Conference Hall in aid of the Charities.

Thursday, April 19th—

9.30 p.m.—Sixth Session (Private).
3 p.m.—Presentation of Purses.
7.30 p.m.—Conversazione at York Liberal Club, Clifford Street.
—— p.m.—Annual Meeting of the National Association of Non-Collegiate Certificated Teachers.
9 p.m.—Conference Ball at the Assembly Rooms.

LONDON MATRICULATION.

JUNE 1900.

BY R. C. B. KERIN, B.A. (LOND.),

First in First Class Classical Honours at Final; Principal, Carlyon College, 55 Chancery Lane, W.C.

LATIN COURSE FOR APRIL.

1. Cæsar.—Revise to the end of Book IV. and the first ten chapters of Book V.

2. Grammar.—Learn the verbs of the fourth conjugation that are irregular in the perfect and supine. In the syntax, learn the rules for (*a*) conditional or hypothetical clauses, (*b*) relative clauses, (*c*) casual clauses. Learn the various methods of expressing purpose and result. The construction used after verbs of fearing should be thoroughly known.

3. *Anglice Reddenda*, Nos. 70–80.

4. Sentences from Bradley's *Arnold* or Bayfield's or Allen's *Exercise Book*.

Notes on Grammar.

The normal rules for conditional statements are as follows:—

1. If the indicative, the imperative, or the subjunctive used as an imperative, is found in the apodosis (principal clause), the indicative is used in the protasis ("if" clause).

2. If the subjunctive is in the apodosis, the subjunctive is also used in the protasis. The subjunctive is used in the apodosis if there is a "would" or "would have" in English, or the equivalent of "would" or "would have:" for example, "could have" is generally = "would have been able." The best practical rule for the student to go by is this: let him look to the apodosis and see whether the subjunctive will be required as above; if not, let him use the indicative in both the protasis and apodosis.

Now, the next question is that of the tense to be used. If the subjunctive is required, use the present subjunctive to denote future time, the imperfect subjunctive to denote present time, and the imperfect or pluperfect subjunctive to denote past time. (The imperfect will denote a continuous action, while the pluperfect will denote a momentary or antecedent action. Occasionally we find the imperfect used for pluperfect—as, *vellem*, "I should have wished.") If the indicative is used, the tenses will be the same as in English, except in regard to future time, where in English, in the protasis, the present is often used to denote future time. In that case, the simple future must be used in Latin in both clauses if both actions go on together in the future; but if one is over before the other begins, the future perfect and future are to be used—for example, *Hoc faciet si poterit*, "He will do this if he is able;" *Tibi parcemus si hoc feceris*, "We shall spare you if you do this." In the first case, the actions denoted by *faciet* and *poterit* go on together; in the second case, "doing" is over before the "sparing" begins. The literal translations are—"He will do this if he will be able;" "If you shall have done this, we shall spare you."

Purpose (or *final*) clauses are expressed in Latin by (*a*) *ut* and subjunctive, (*b*) *qui* and subjunctive, (*c*) *ad* with gerund or gerundive, (*d*) genitive of gerund or gerundive with *causa*, (*e*) supine in *-um* after verbs of motions. *Result* (or *consecutive*) clauses are expressed by *ut* and the subjunctive. The relative with the subjunctive often indicates a result. Avoid using the infinitive to express a purpose. Remember that "that not" is translated by *ut non* in a negative result, by *ne* in a negative purpose. In the same way, *ut nemo* is, "so that no one;" *ne quis*, "in order that no one;" *ut nunquam*, "so that never;" *ne unquam*, "in order that never" or "lest ever;" *ut nusquam*, "so that nowhere;" *ne usquam*, "lest anywhere."

Verbs of fearing are followed by (*a*) *ne* and subjunctive to represent a "that" clause in English; (*b*) *ut*, or *ne non*, to represent a "that not" clause in English; (*c*) infinitive when there is an infinitive in English—for example, *Timeo ne hoc faciat; timeo ut (ne non) hoc faciat; timeo hoc facere.*

The subjunctive is used in relative clauses when the relative denotes (*a*) Purpose, (*b*) Result, (*c*) Concession, (*d*) Cause. Under heading (*b*) comes the case when the antecedent of the relative is an indefinite word, when the relative refers to a class and not to definite persons or things. This subjunctive is sometimes known as the descriptive or generic subjunctive. It is very common in Latin. Distinguish *is est qui hoc facit*, "he is the very man who does this," from *is est qui hoc faciat*, "he is just the man to do this."

Quod, meaning "because," takes the subjunctive when the reason alleged is not the reason of the speaker or writer, but that of some one else—for example, *Congratulatur ei quod abierit*, "He congratulates him on his going away" (as he says); *Eum quod patrem prodidisset accusavit*, "He accused him of betraying his father" (because, as he said, he betrayed his father). *Non quo*, "not because," nearly always requires the subjunctive; because if you deny a reason, you deny it because some one has brought or is likely to bring it forward. These subjunctives are due really to *oratio obliqua*, and are called subjunctives of *sub-oblique oration*.

The following summary, taken from Postgate, will be useful:—

Translation of "that." The English "that" must be differently translated into Latin according to its sense:—1. After words of *saying* and *thinking*, by infinitive and accusative. 2. If it means "the fact that," by *quod*. 3. If it denotes "consequence," by *ut*, etc. 4. If it denotes "purpose," by *ut*. 5. If it denotes "the object of fear," by *ne*. 6. After negatives, often by *quin*. 7. "Oh that" is expressed by *utinam*.

Translation of "to." The English "to" with verbs is translated:—1. By the simple infinitive. 2. After verbs of hoping, threatening, and promising, by the future infinitive and accusative. 3. "To" of purpose is variously expressed in Latin. For "He sent soldiers to burn the town" we may have:—

Misit milites
(1) ut urbem cremarent.
(2) qui urbem cremarent.
(3) ad urbem cremandam.
(4) urbis cremandae causa.
(5) urbem crematum.

Typical Sentences.

26. "It is of paramount importance to me and my friends whether war breaks out or this people remains loyal."

Utrum bellum erumpat an hic populus in officio maneat mea et amicorum meorum maxime interest.

Notes.—(*a*) "It is of importance to" is expressed by *interest*. Now the dative must not be used after *interest*. The person to whom a thing is of interest is expressed by the *genitive*, except when the person is represented by a personal pronoun of the first or second person, or by the third reflexive. In the latter case, the ablative feminine singular of the corresponding possessive adjective is used. Hence above we write *mea* and *amicorum*. (*b*) The subjunctives *erumpat* and *maneat* are due to the fact that they are the verbs in a dependent interrogative sentence. Note the tenses of the subjunctive, and see the rules for the sequence of tenses. (*c*) *Utrum.....an* = "whether.....or" in interrogative sentences. Be careful not to use *sive.....sive* (found in adverbial sentences), or *aut.....aut*, "either.....or."

27. "Each of us was afraid that the queen would be persuaded to go to Gaul before the games were held."

Ne reginae persuaderetur ut in Galliam iret antequam ludi ederentur (or *ante ludos editos*) *nostrum quisque timebat.*

Notes.—(*a*) After verbs of fearing (1) a "that" clause is expressed by *ne* and the subjunctive; (2) a "that not" clause by *ne non* or *ut* and the subjunctive; (3) an infinitive by an infinitive—for example, *Timeo ne non hoc faciat*, "I fear that he will not do this;" *Mori timeo*, "I fear to die." (*b*) *Persuadeo* governs the dative in the active, therefore it is used impersonally in the passive. (*c*) Do not express "go" by the infinitive. The infinitive here expresses purpose, therefore use *ut* and the subjunctive. (*d*) *Antequam* is here followed by the subjunctive, because the sentence is a dependent sentence in *oratio obliqua*. It forms part of what they thought when they feared. In Latin, whenever a sentence expresses not the idea or thought of the speaker or writer, but that of some one else, the subjunctive is used in that sentence. Note the alternative version, lit. "before the games brought out," and compare *ab urbe condita*, "from the foundation of the city."

28. "We say that it was not every one who knows what measures to adopt at such a crisis as this."

Quae consilia in hoc tali discrimine capi debeant scire esse cuiusvis negamus.

Notes.—(*a*) "It is not every one" = "it is not the characteristic of any one you please." The predicative genitive of *quivis* is used. "Any one," when it means "any one you please," is translated by *quiris*. *Quisquam* in a negative sentence means, "no one at all." (*b*) Be careful not to use the infinitive in Latin in cases similar to the above. The deliberative subjunctive, or *debeo* with infinitive, must be used. "What measures to adopt" is equivalent to "what measures are to be" or "ought to be adopted." (*c*) The subjunctive is due to the dependent question. (*d*) The Latins could not say, *in tali discrimine quam hoc*, when two things are not compared, but said, "this such a crisis."

29. "The brave Cæsar threatened to put in chains all the most mutinous men if the soldiers did not leave the fair city of Capua before the first of the month."

Caesar vir fortissimus se seditiosissimum quemque in vincula

conjecturum est minatus nisi milites Capua ex illa pulcherrima urbe ante kalendas excessissent.

Notes.—(*a*) An adjective is not attached to a proper name unless a word like *vir*, *homo*, *femina* is used. *Fortis Caesar* would not be good Latin. The Romans said, *Pompeius Magnus*, but *magnus* in this instance was used as a kind of title. (*b*) Note the future infinitive after *minor*. It is not necessary to express *esse*. (*c*) *Excessissent* is in the subjunctive because it is in oblique oration. It is part of what Caesar said when threatening. Reported speech in Latin, when the exact words uttered are not reported, requires the subjunctive in the dependent clauses (sub-oblique oration). (*d*) Note how to express "all the" with a superlative. In Latin the superlative adjective and *quisque* are used; *quisque* is placed after the superlative. (*e*) For *Capua ab illa pulcherrima urbe*, see sentence 23. Avoid writing *ab pulchra urbe Capuae*.

30. "It is your interest to keep as many men loyal as possible."
Quam plurimos in officio retinere magni interest.

Notes.—The infinitive can be used in Latin as the subject of an impersonal verb. *Ut* and the subjunctive might have been used above, though in the case of most impersonal verbs you have not a choice. Some verbs require *ut* and the subjunctive—for example, *accidit*; others the infinitive—for example, *poenitet*: with *poenitet*, *ut* would not be permissible.

31. "We do not know whether he will go to Paris or not."
Utrum Lutetiam necne iturus sit nescimus.

Notes.—(*a*) "Or not," in the second part of a disjunctive question, is expressed by *annon* if the disjunctive question is a direct one, *necne* if the disjunctive question is indirect. Hence in the sentence above *necne* is normal. (*b*) The future subjunctive, if it is necessary to express it, is formed by the future participle with the subjunctive of *sum*. (*c*) The subjunctive is due, of course, to the dependent question.

32. "What was he to do? If he admitted that you were so foolish as to consult the interests of this man, every one would have blamed him."
Quid faceret? Nam si te tam stultum fuisse ut huic consuleres esset confessus, omnes eum culpavissent.

Notes.—(*a*) *Faceret* is deliberative subjunctive. (*b*) *Quid* must be used, not *quod*. The former is the interrogative pronoun, the latter the interrogative adjective or relative pronoun. (*c*) The subjunctive is used after *si* because the subjunctive is used in the principal clause. The subjunctive is used in the principal clause because there is a "would have" in English. (*d*) "So foolish as to" must not be translated by *tam stultus quam*, etc. "So foolish as....," when a comparison is drawn between two persons, is translated by *tam stultus quam*. (*e*) Note the subjunctive after *ut* consecutive. (*f*) *Consulo* governs the dative of the person whose interests are consulted.

Sentences for Practice.

(Readers can have their solutions corrected by sending them to the Editor Matriculation Course, *P. T.*, and enclosing 7 stamps.)

1. O happy man, to have fought without receiving a wound!
2. I am inclined to think that it is not every one who would spare such cowards as these men.
3. It is of paramount importance to the nation to strain every sinew to finish the war as quickly as possible. (Avoid a literal translation of "strain" and "sinew.")
4. If you had promised to cut off supplies (*commeatus intercludere*) from the enemy, you would have been praised by all of us.
5. They might have threatened to kill the fox if they had caught it.
6. The cowardly Dolabella ran away as soon as he caught sight of the weapons of the enemy, who were advancing in close array.
7. We did not know what to do, seeing that the enemy were surrounding us on every side.
8. He said that it would not have mattered if he had heard how you had killed this man.
9. We were so angry with the general that we at once left the winter camp at Gergovia and marched twenty miles.
10. It is well known (*constat*) that it is not every one who prefers to meet death a hundred times rather than live in dishonour.

FOR MAY EXAMINATIONS.

PRINCIPLES OF ORNAMENT.

ANSWERS TO SOUTH KENSINGTON EXAMINATION QUESTIONS.

See PRACTICAL TEACHER'S ART MONTHLY for April.
Price Twopence.

Order from your Bookseller.

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Discipulus.—We recommend the books of the "Parallel Grammar Series." They are prepared on sound educational principles, and will fully satisfy your requirements. You should order the *French Grammar* by L. M. Moriarty, M.A. (Part I., Accidence; Part II., Syntax), and the *French Reader and Writer* by Morich and Lyon. The Parallel Series includes grammars of Greek, Latin, English, German, Spanish, Danish, and Welsh; and the publishers are Messrs. Swan Sonnenschein and Co., Limited, Paternoster Square, London.

The Wellington College *French Grammar*, by MM. Eve and De Baudiss, is another excellent book, and is frequently mentioned in prefaces to the Cambridge Press editions of French texts. It is published by Mr. David Nutt, Long Acre, London, W.

Scotch.—Marks may be obtained for *two* subjects of Language and Science, but one of these must be a language. If only one subject be taken, it can either be a science or a language. The science must be taken at a Science and Art examination in 1900. Therefore "Scotch" cannot get marks for Physiology and Physiography or Physiology and Hygiene, but for only one of these and a foreign language.

Freehand receives, First Class, 20; Second Class, 10, if obtained in 1900; but if "Scotch" tries Model and does well in it, a certificate gained in 1899 in Freehand will count.

Nemo.—The book to which you refer—that is, Harrison and Baxandall's *Practical Plane and Solid Geometry* (*Advanced*)—completely covers the whole syllabus.

Dimp.—Show that $4\cos^2\frac{\pi}{7}$ is a root of $x^3 - 5x^2 + 6x - 1 = 0$, and find the other roots. (Honours, I., Stages 1, 2, 3, 1899.)

From (*a*) of the same question,

$$\frac{\sin 7\theta}{\sin\theta} = 64\cos^6\theta - 80\cos^4\theta + 24\cos^2\theta - 1,$$

$$\text{or } \frac{\sin 7\theta}{\sin\theta} = (4\cos^2\theta)^3 - 5(4\cos^2\theta)^2 + 6(4\cos^2\theta) - 1$$

$$= x^3 - 5x^2 + 6x - 1, \text{ say } \ldots\ldots (1)$$

Now, if θ has any of the values $\frac{\pi}{7}, \frac{2\pi}{7}, \frac{3\pi}{7}, \frac{4\pi}{7}$, etc., it is clear that $\frac{\sin 7\theta}{\sin\theta}$ will be zero. Hence we are sure that the right-hand side will be zero when for x we put one of the values, $4\cos^2\frac{\pi}{7}, 4\cos^2\frac{2\pi}{7}, 4\cos^2\frac{3\pi}{7}, 4\cos^2\frac{4\pi}{7}$, etc. But these values are not all different, for

(1) $4\cos^2\frac{\pi}{7} = 2\left(1 + \cos\frac{2\pi}{7}\right)$.

(2) $4\cos^2\frac{2\pi}{7} = 2\left(1 + \cos\frac{4\pi}{7}\right)$.

(3) $4\cos^2\frac{3\pi}{7} = 2\left(1 + \cos\frac{6\pi}{7}\right) = 2\left[1 + \cos\left(\pi - \frac{\pi}{7}\right)\right]$.

(4) $4\cos^2\frac{4\pi}{7} = 2\left(1 + \cos\frac{8\pi}{7}\right) = 2\left[1 + \cos\left(\pi + \frac{\pi}{7}\right)\right]$.

Now (4) is (3) repeated, for $\cos\left(\pi - \frac{\pi}{7}\right) = \cos\left(\pi + \frac{\pi}{7}\right)$.

In the same, if in $\frac{n\pi}{7}$ we put n a greater integer than 3, we should not obtain a new root. Hence there are three roots. Observe that we may not put 0 for n, for then $\frac{\sin 7\theta}{\sin\theta} = 7$, not zero.

Max.—(*a*) Find the value of the ratio $\frac{x}{\tan x}$, when x is made indefinitely small—(1) when x is measured in radians; (2) when x is measured in degrees. (*b*) Find the greatest value of the expression $a \cos\theta + b \sin\theta$, where a and b are constants, and θ may have any value. **(Stage 3, 1898.)**

(*a*) $\frac{x}{\tan x} = x \div \frac{\sin x}{\cos x} = \frac{x}{\sin x} \cdot \cos x.$

(1) If x means the number of radians in it, then it is the easiest of problems to show that $\frac{x}{\sin x}$ and $\cos x$ each approach nearer and nearer to 1 as x becomes smaller and smaller without limit; hence $\frac{x}{\tan x} = 1$ when x is indefinitely small. This may be *realised* from a figure at a glance. You will find it proved in any text-book on trigonometry.

If x means a number of degrees, $x \div 57{\cdot}3$ is the number of radians in it.

$$\text{But } \frac{x}{\sin x} = 57{\cdot}3\,\frac{\frac{x}{57{\cdot}3}}{\sin x} = 57{\cdot}3\,\frac{\text{radians in angle}}{\text{sine of angle}}$$
$$= 57{\cdot}3 \times 1 \text{ when the angle is indefinitely small.}$$

(*b*) $a\cos\theta + b\sin\theta = \sqrt{a^2+b^2}\left(\frac{a}{\sqrt{a^2+b^2}}\cos\theta + \frac{b}{\sqrt{a^2+b^2}}\sin\theta\right).$

Put $\frac{a}{b} = \tan\alpha$, then the right-hand side is $\sqrt{a^2+b^2}$ (sin α cos θ + cos α sin θ), or $\sqrt{a^2+b^2}\sin(\alpha+\theta)$.

The greatest value of this is $\sqrt{a^2+b^2}$, since a sine cannot be greater than 1.

W.J.D.—Find the sum of n terms of the series, the r^{th} term of which is $(2r+1)2^r$. (Hall and Knight's *Algebra*, p. 46.)

Give to r in succession the value 1, 2, 3, etc., and the series becomes

$$3.2 + 5.2^2 + 7.2^3 + 9.2^4 + \ldots (2n+1)2^n.$$

Each term consists of two factors. The first factors form an A.P., and the second factors a G.P. In such a case multiply through by the common factor (in this case 2) and subtract—thus, If S_n = sum of n terms,

$$\begin{aligned} S &= 3.2 + 5.2^2 + 7.2^3 + \ldots (2n+1)2^n, \\ 2S &= \quad 3.2^2 + 5.2^3 + \ldots (2n-1)2^n + (2n+1)2^{n+1}. \\ \therefore -S &= 3.2 - (2n+1)2^{n+1} + 2(2^2 + 2^3 + \ldots 2^n) \\ &= 3.2 - (2n+1)2^{n+1} + 2^3 + 2^4 + \ldots 2^{n+1} \\ &= 3.2 - n2^{n+2} + (2^3 + 2^4 + \ldots 2^n) \\ &= 3.2 - n2^{n+2} + \frac{2^3(1-2^{n-2})}{1-2} \\ &= 3.2 - n2^{n+2} - 2^3 + 2^{n+1}. \\ \therefore S &= 2 + 2^{n+1} - n2^{n+2}. \end{aligned}$$

J. Culver.—The angle subtended by the diameter of the sun at the eye of an observer is 32′. Find approximately the diameter of the sun if the distance from the observer be 90,000,000 miles. (Lock's *Elementary Trigonometry.*)

The diameter is practically the length of an arc subtending an angle of 32′ at the centre of a circle of radius 90,000,000 miles.

Hence, since $\frac{\text{arc}}{\text{radius}} = \text{angle in radians}$,

$$\frac{\text{diameter of sun}}{90{,}000{,}000} = \frac{32}{60}\,\frac{1}{\frac{180}{\pi}} = \frac{32\pi}{60\times 180}.$$

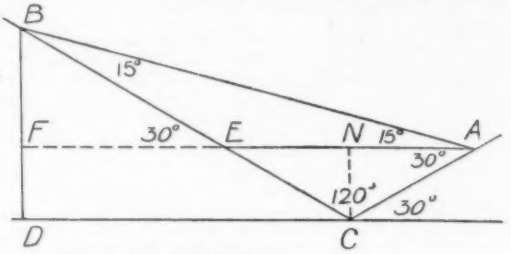
$$\therefore \text{diameter} = \frac{90{,}000{,}000 \times 32\pi}{60\times 180} = \frac{800{,}000\pi}{3}$$
$$= \frac{800{,}000 \times 22}{3\times 7} = 838{,}000 \text{ miles.}$$

Gardens.—Divide £600 among three persons so that the 1st and 2nd get 5 times the 3rd, the 2nd and 3rd 4 times the 1st.

If 1st + 2nd = 5 times 3rd,
1st + 2nd + 3rd = 6 times 3rd;
∴ 600 = 6 times 3rd,
∴ 100 = 3rd share.
Similarly, if 2nd + 3rd = 4 times 1st,
1st + 2nd + 3rd = 5 times 1st;
∴ 600 = 5 times 1st,
∴ 120 = 1st share,
∴ 600 − 220 = 2nd share = 380.

The three shares are therefore £120, £380, and £100.

Grange Crescent.—The sides of a valley are two parallel hills, each of which slopes upwards at an angle of 30°. A man walks 300 yards directly up one of them from the valley, and then observes that the angle of elevation of the top of the other hill above the horizon is 15°. Show that the height of the latter is approximately 409·8 yards. (Stage 2, Math., Clive and Co., p. 186.)



CN = ½ CA = 150 yards.
NA = √3 CN = 150 √3 yards.
EA = 2 NA = 300 √3 yards.
BE = EA (because EBA is 15°)
= 300 √3 yards.
BF = ½ BE = 150 √3 yards.
BD = BF + FD = 150 √3 + 150 (FD = CN)
= 150 (√3 + 1) = 150 × 2·732
= 409·8 yards.

C. W. F.—If a tunnel were bored through the earth down to the Antipodes, the value of gravity at any point in it would be proportional to the distance from the centre, the earth being assumed to be of uniform density. Show that a body dropped down the tunnel would arrive at the Antipodes in about 42½ minutes. (The earth's radius may be taken at 4000 miles.) (B.A. Pass Exam., Mixed Mathematics, Oct. 1892.)

This is a case of simple harmonic motion of amplitude 4000 miles, and we know that when the displacement from the centre is 4000 miles, the acceleration is 32 feet per second.

Now, $$T = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration}}},$$

$$\therefore T = 2\pi\sqrt{\frac{4000\times 5280}{32}} = 5104 \text{ secs.}$$

But T means the time of a *complete* vibration, therefore the answer required is 2552 seconds, or 42·5 minutes.

Calculus.—For Stage 5 you may omit chapters vii., ix., x., xi., xii., in Edwards's *Differential Calculus for Beginners.* In the same author's *Integral Calculus* you may omit chapters vii., ix., x., xii., and all the chapters which follow. You will find Wilson's *Solid Geometry and Conic Sections*, published by Macmillan (3s. 6d.), a useful book. We are not aware of any which is specially adapted to the requirements of this stage.

A.D.—Solve $(x-4)(y-4) = 8,$
$x^2 + y^2 = 100.$
(Stage 2, 1893.)

$$\begin{aligned} (x-4)(y-4) &= 8, \\ xy - 4(x+y) &= -8, \\ 2xy - 8(x+y) &= -16 \ldots\ldots (1) \\ x^2 + y^2 &= 100 \ldots\ldots (2) \end{aligned}$$

Add (1) and (2)—
$$(x+y)^2 - 8(x+y) = 84.$$
Putting z for $x+y$, we get—
$$z^2 - 8z - 84 = 0,$$
$$(z-14)(z+6) = 0.$$
$$\therefore x+y = 14, \text{ or } x+y = -6.$$
Putting these in (1), we get—

$2xy = 96,$	or	$2xy = -64;$
$x^2+y^2 = 100,$		$x^2+y^2 = 100;$
$x^2 - 2xy + y^2 = 4,$	or	$x^2 - 2xy + y^2 = 164;$
$x - y = \pm 2,$	or	$x - y = \pm 2\sqrt{41};$
$x + y = 14,$	or	$x + y = -6;$
$2x = 16 \text{ or } 12,$	or	$2x = \pm 2\sqrt{41} - 6;$
$2y = 12 \text{ or } 16,$	or	$2y = \mp 2\sqrt{41} - 6;$
$x = 8 \text{ or } 6,$	or	$\sqrt{41} - 3, \text{ or } -\sqrt{41} - 3;$
$y = 6 \text{ or } 8,$	or	$-\sqrt{41} - 6, \text{ or } \sqrt{41} - 3.$

(*Alpha*, *Crescent*, *Felix*, *Math.*, *Bike*, and *Timothy* may have solutions by past.—Ed.)

OUR SCIENCE SECTION

☛ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this Number.**

STAR STUDY
FOR SCHOLARSHIP STUDENTS.

V.—APRIL.

THE constellations to which we have already called attention, and which it must be the first care of the student to find, are placed as follows :—

Zenith.—Ursa Major, Leo, and Draco, the last named being situated somewhat to the north-east of the zenith point.

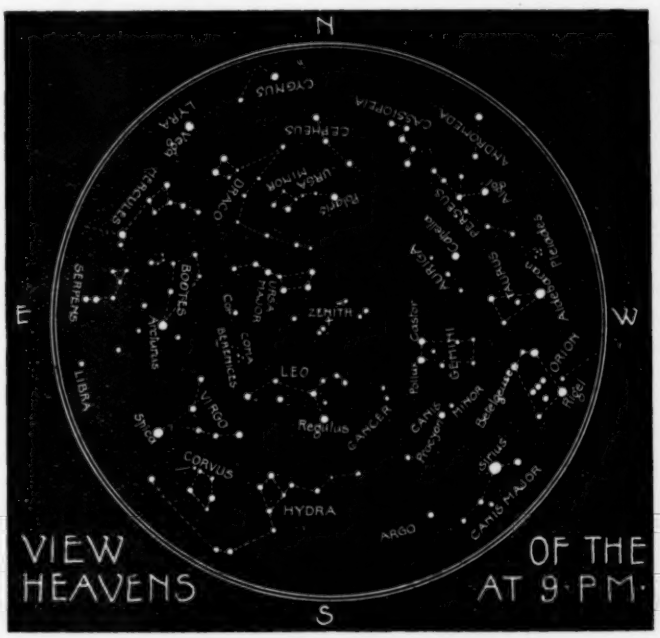
North.—Ursa Minor, Cepheus, and Cassiopeia.

East.—Virgo, which will towards the end of the month be in an exceedingly good position for observation. The Y-shape of the group should be especially noted. Spica, the brilliant first-magnitude star, which is the cynosure of this asterism, is situated at the point of the Y.

South.—Canis Minor, with its bright particular star Procyon, is the most conspicuous group in the southern heavens.

West.—Gemini, Orion, and Taurus, with the Pleiades, are the objects to be sought in the western heavens.

New Work.—Attention has to be drawn this month to two additional constellations that are well situated for observation for the first time since the commencement of our studies. These are **Libra** in the east and **Hydra** in the south.



STAR MAP NO. V. (APRIL).

Libra.—This, the seventh of the zodiacal constellations, will be found just above the eastern horizon. It consists of a triangle of faint stars, the brightest of which, β Libræ, is only of the third magnitude. This star, as may be seen from the map, is at the apex of the triangle, just under the constellation the Serpent. Were it not for its position in the zodiac it would be unnecessary to note this insignificant constellation.

Hydra.—This long, dull, and straggling group of stars contains one bright star, Alphard, which may be found under and in a line with the two brightest stars of the reaping hook or sickle of Leo, to which we have already called attention. The head and neck of the Snake are formed by a graceful curve of small stars ending just below Cancer, whilst the tail trails along below Leo and Corvus, ending finally near Libra. Alphard is sometimes spoken of as Cor Hydræ, the heart of the serpent.

Corvus is the name given to the compact little constellation that is wedged in between Hydra and Virgo.

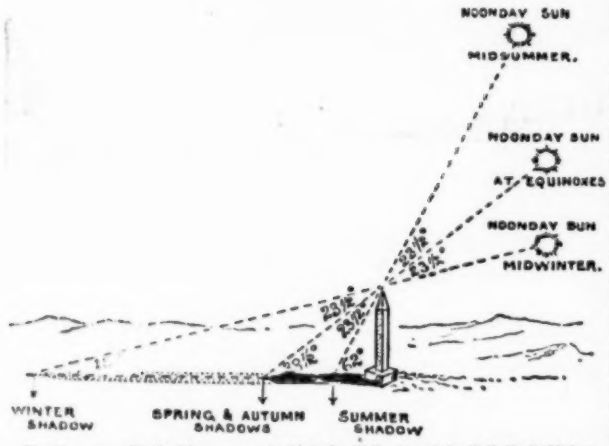
Planets.—Venus is still an evening star, and is a most beautiful object to observe, shining as she does in the western sky with a magnificent silvery light. On the 3rd of the month she will be found near the moon in the constellation Taurus. On the 28th she is at her greatest eastern elongation, when she sets about four and a half hours after the sun.

Jupiter.—The giant planet is a morning star in the constellation Ophiucus, of which we have as yet said nothing. On the morning of the 18th inst. he will be found near the moon.

Mercury.—This planet, which is not easy to see, is in Pisces, and may be seen just before sunrise towards the end of the month. Mercury may sometimes be seen about thirty minutes after sunset in April hovering fugitively on the brow of the horizon. The student should strive hard to see Venus, Jupiter, and Mercury during this month; he must not, however, be discouraged if the twilight-veiled splendour of the messenger of the gods, as Mercury is called, eludes his vision, for it is said that the astronomer Copernicus never was successful in viewing this interesting heavenly object. Should the student be fortunate enough to succeed, he should carefully compare the beautiful white lustre of Venus; the strong, steady, yellowish light of Jupiter; and the white, fainter light of Mercury—all the more faint because of the twilight in which alone it can be seen.

The Milky Way or Galaxy.—The student may now include in his observation the appearance and position of the Milky Way, than which no celestial object is more striking and none more important. This luminous zone of whitish colour and of irregular edges divides the celestial sphere into two nearly equal parts, marking on the celestial sphere almost a great circle. At a point which the student should observe the pearly patch bifurcates. He should also ascertain the angular measurement of the patch in degrees, and notice the position of the constellations with respect to the Milky Way and the rest of the heavens. He will find that the vast majority of the stars are situated in close proximity to this wonderful zone. Viewed with the naked eye, the galaxy appears to consist of vaguely-defined luminous matter, but a telescope soon makes it clear that the nebulous matter is mainly composed of minute stars, the number of which is stupendous. Sir William Herschell, who paid particular attention to this subject, calculated that no less than 116,000 stars crossed over the field of his telescope in a quarter of an hour, and on another occasion 258,000 in forty-one minutes. Basing his calculations upon these observations, Sir William considered that not less than 50,000,000 stars are to be seen in the circuit of the Milky Way, some portions of which consist of nebulæ, or at least of stars so small as to defy the magnifying power of our greatest telescopes.

The Sun's Altitude.—Yet another observation should now



The Gnomon. Method by means of which the Obliquity of the Ecliptic (23½°) has been determined. The altitudes given are for the latitude of London.

be undertaken by the student at least once a week. This is the altitude or angular distance of the sun above the horizon at noon. This can be done directly by pointing a line to the zenith and another one to the sun at noon, and subtracting this angle from a right angle; or, indirectly, by observing the shadow cast by an upright pole, and by completing the triangle made by the pole, the shadow, and the line joining the top of the pole to the end of the shadow, as in the annexed diagram. These angles should be entered in a notebook, and should be carefully compared from time to time.

NOTES ON PHYSIOLOGY:

EMBRACING THE SUBJECTS OF THE *ADVANCED* AND *HONOURS* STAGES, SCIENCE AND ART DEPARTMENT.

BY WALKER OVEREND, M.A., M.D. (OXON.), B.SC. (LONDON),

Physician to the Tottenham Hospital;
Late Radcliffe Fellow, Scholar of Balliol College, and Exhibitioner in Comparative Anatomy of the London University.

QUESTIONS SET AT MAY EXAMINATION, 1899.

23. Describe the glands of the stomach—the differences between those at the cardiac and pyloric ends. The composition, nature, and action of gastric juice.

The gastric glands are simple microscopic tubes which occupy nearly the whole thickness of the mucous membrane of the stomach. Each tube opens on the surface as a minute depression, and is blind below. The first portion of a cardiac gland is lined by a layer of columnar cells. In the rest of the tube two kinds of cells are visible. Those on the outside are granular, nucleated, and stain deeply with aniline blue. The inner cells are smaller, cubical in shape, and termed *central* cells. The glands in the pyloric part of the stomach are also tubular, and they are lined almost together by cylindrical cells. At the bottom there are a few like the central cells of the cardiac area.

The gastric juice contains nearly one per cent. solids, of which about four-tenths consist of pepsin, two-tenths free HCl, the remainder being composed of NaCl, $CaCl_2$, etc. It also contains about 2 per cent. of free HCl. The central cells apparently secrete the *pepsin*, and a ferment which coagulates milk—the *rennet* ferment. The large, oval, deeply-staining cells apparently secrete the HCl. The granules in the central cells diminish in number as digestion proceeds; the acid-secreting cells become somewhat larger at this time.

The essential property of the gastric juice is that of converting insoluble proteid into *peptone*, and this depends on the activity of the pepsin when in the presence of free HCl. Neither pepsin nor HCl is active alone. Peptones are not precipitated by heat, alcohol, ferrocyanide of potassium, and acetic acid, and they yield a rose colour with a dilute solution of copper sulphate. There are certain intermediate products between the proteid and peptone, which are termed *albumoses*. After a meal, peptone begins to be produced within the stomach; but it never accumulates, inasmuch as it is, *pari passu*, absorbed by the mucous membrane. Since there is but a trace of peptone in the portal vein, it is believed that the mucous membrane of the stomach converts it back again into some soluble form of albumin before allowing it to reach the circulation.

25. The structure of a lobule of the liver; its blood-vessels, and the means of discharge of bile from it. Nature, properties, and fate of glycogen.

The liver consists of a multitude of lobules, about the size of a pin head, somewhat flask-shaped, and separated from each other by an extension within the interior of the liver of its external fibrous covering. Each lobule is full of cells. These are cubical in shape, and each contains a nucleus, granules of glycogen, and droplets of oil. The portal vein, hepatic artery, and hepatic duct lie in the transverse fissure on the under surface of the liver, and they pass in into the fibrous envelope. The branches of the portal vein become smaller and smaller, and reaching the spaces between the lobules, are termed *interlobular* veins. From these small branches enter the lobules, passing between the rows of cells towards the centre, where they unite again to form *intralobular* veinlets, which are the rootlets of the hepatic veins. The capillary network of each lobule is so minute as only to admit two cells abreast, although there may be room for several arranged tandem. Where the sides of the liver cells are in contact, the high powers of the microscope may detect the existence of minute holes. Each hole is the section of a minute canal—a bile capillary. Evidently between the blood and the bile capillaries a portion of liver cell is interposed, and its secretion (drops of bile) easily passes into the bile capillary, and finally into the hepatic duct.

Glycogen is a carbohydrate, represented by the formula $C_6H_{10}O_5$. It is found in the liver and muscles. When prepared from the liver and dried, it is a white powder, soluble in cold water, and giving a red colour with tincture of iodine. It is insoluble in alcohol.

Immediately after death the liver contains no sugar. When a rabbit is killed and the liver rapidly removed, minced, and thrown into boiling water, an opalescent solution of glycogen is the result, but there is the minutest trace of sugar only. If the liver be not removed for several hours, it contains a good deal of sugar (glucose $C_6H_{12}O_6$), and the glycogen is diminished or has disappeared. The blood in the hepatic veins contains a larger percentage of sugar than that of the portal vein.

The chief use of glycogen appears to be the maintenance of a normal percentage of sugar in the blood. This is about one in a thousand. If it be increased by the injection of a solution of sugar into the circulation, the excess is rapidly excreted by the kidneys, and appears in the urine. In starving animals the glycogen in the liver diminishes or disappears entirely. It has apparently been converted into sugar, and made use of in the body. Glycogen is present in the muscles, and serves to some extent as a local supply of reserve material for the production of muscular energy.

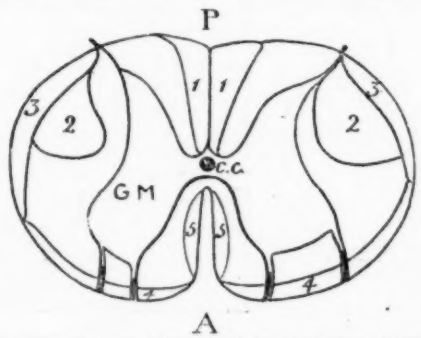


DIAGRAM OF SPINAL CORD IN THE LOWER PART OF THE NECK.

A, Anterior, and *P*, posterior surface of spinal cord; 1, Posterior median column; 2, Lateral pyramidal tract; 3, Cerebellar tract; 4, Anterior ascending tract; 5, Anterior pyramidal tract; *G.M.*, Gray matter; *c.c.*, Central canal of the spinal cord.

24. Facts concerning urea—its origin and excretion.

Urea consists of $CO(NH_2)$ (NH_2)—that is, carbonic acid $(CO(OH)_2)$, in which two semi-molecules of hydroxyl are replaced by amidogen, NH_2. It is a crystalline body, without smell, very soluble in water. Nearly all the nitrogen of the proteids entering the body passes out through the kidneys as urea, which, with CO_2 and H_2O, are to be considered the end products of the chemical decomposition of proteids. Its place of formation is principally the liver, although the lymphatic glands may produce a certain amount. It is excreted by the

epithelium cells of the convoluted tubules. About 500 grains of urea are excreted in the urine every twenty-four hours.

28. The structure of the sympathetic nervous system, and its connection with the spinal cord. Its functions.

It consists of two long nerve cords lying in the neck, thorax, and abdomen, close to the vertebral column. At certain intervals there are seen thickenings, some about the size of a small bean, called *ganglia*. Each spinal nerve sends a small branch to the ganglion nearest to it, which is termed the communicating branch (*ramus communicans*). These branches consist of very fine nerve fibres—much finer than usual—which supply all the blood-vessels, the unstriped muscular fibre of the viscera, and the muscular fibres of the heart. They run also in the spinal cord to the general vasomotor centre in the medulla oblongata. Those which supply the heart, when stimulated, produce increased force and frequency of its beats, and are therefore called *augmenting* or *accelerating* nerves.

Certain of the ganglia in the thorax send branches which unite to form the *splanchnic* nerves, which are distributed to the blood-vessels within the abdomen, the small and large intestines, stomach, kidneys, etc. They form a very large and intricate network below the stomach, called the *solar plexus*. When the splanchnic nerves are divided, there are an immense dilatation of the blood-vessels in the abdomen and a great fall of blood pressure. Hence the splanchnics carry vaso-constricting impulses. They also carry fibres to the unstriped muscle of the wall of the intestine, which inhibit or restrain peristalsis.

28. Day Examination, 1899. Describe the structure of a typical section of the spinal cord. How has it been ascertained that there are definite paths of tracts in the cord along which certain kinds or classes of impulses pass?

In this question describe the anterior and posterior fissures, the central canal, the white matter—consisting of axis cylinders and medullary sheath—lying outside, the grey matter containing nerve-cells in addition.

It has been ascertained that certain impulses pass along certain parts of the cord. One method of proving this is by studying diseased conditions.

The anterior and lateral pyramidal tracts contain fibres which carry motor impulses (volitional) from the brain to the limbs. These fibres degenerate after a few weeks when a block occurs in their course from the brain, as may occur in hæmorrhage of one of the arteries within the brain. Other methods are those of experiment. It is believed that touch impulses travel to the brain in the posterior median columns. The cerebellar tract appears to contain fibres which run up to the cerebellum, carrying impulses which assist in the preservation of equilibrium.

MATHEMATICS.

STAGES 2 AND 3, SCIENCE AND ART DEPARTMENT.

BY G. A. BAXANDALL,

Assistant, Mathematical and Mechanical Division, Royal College of Science, London.

Stage 2.

Algebra.

Ratio, Proportion, and Variation.

C. Smith, chap. xxi., especially Arts. 194, 202, 204, 211, 213.

Hall and Knight, chap. xxxii., especially Arts. 291, 294, the worked examples of Arts. 302, 306, 311.

Hamblin Smith, chaps. xxvii., xxviii., xxix., especially Arts. 355, 359, 364, 371.

Todhunter and Loney, chaps. xxxii., xxxiii., xxxiv., especially Arts. 351, 352 (do not try to remember the results of Arts. 358 to 363, although 361, 362 are useful), 369, 381, 384, 387.

Work a few examples from each set provided in the text-book.

All *definitions* must, of course, be very carefully considered, especially that of a *mean proportional*. In proportion, many exercises should be worked dealing with equal ratios or fractions, the general method being to put each fraction equal to some single letter, say k. In variation, the most important thing is to acquire the habit of putting $A = mB$, when it is known that A varies as B, and to know that the value of m can be found when a pair of corresponding values of A and B are known.

Work the following examples:—

1. If a, b, c, d denote positive numbers, show that $\frac{a+c}{b+d}$ is intermediate to $\frac{a}{b}$ and $\frac{c}{d}$.

Arrange $\frac{7}{8}$, $\frac{8}{9}$, $\frac{83}{96}$, $\frac{127}{144}$ in order of magnitude. (1898.)

2. Define the ratio compounded of two given ratios.

Find in its simplest form the ratio compounded of

$$\sqrt{3}-1 : \sqrt{2}-1 \text{ and } \sqrt{2}+1 : \sqrt{3}+1,$$

and show that it nearly equals 75 : 48. (1896.)

3. (*a*) If $a^2 - ab + b^2 : c^2 - cd + d^2 :: ab : cd$, show that either $a : b :: c : d$ or $a : b :: d : c$.

(*b*) A quantity x equals the sum of two quantities, one of which varies as t, and the other as t^2. When t equals 3, x equals 159; and when t equals 5, x equals 425. Find the value of x when t equals 10. (1899.) Ans. 1650.

Trigonometry.

In books of mathematical tables are given the logarithms of numbers from 1 up to 1,000, 10,000, or 100,000. Also there are given the sines, cosines, and tangents of all angles, beginning at 0° and increasing by 1°, or even by 1′. Now the student must not confuse sines, cosines, and tangents with logarithms. The former are mere *numbers*, and we may have to obtain their *logarithms*, in which case they would be written "log sin," "log cos," etc.

Since sines and cosines are, in general, *less than* 1, their logarithms are less than nothing, and therefore always consist of a negative integral part. For example, to four figures, sin 32′ = ·5299, and log ·5299 is $\bar{1}\cdot7242$; hence log sin 32 = $\bar{1}\cdot7242$. But in the book of tables will also be found separate tables giving log sin, log cos, etc.; and on looking at the table giving log sin, we find log sin ·32 = $9\cdot7242$, instead of the real value $\bar{1}\cdot7242$. This is because it has been agreed to increase all the real logarithms by 10, so as to avoid *printing* the negative characteristic. We strongly advise the student to *never write* the 10 or 9 which he finds in the tables, but to *subtract the 10 mentally*, and write the negative characteristic, if there be one, so that he will always be dealing with the real logarithm.

Interpolation.—When we find a value intermediate between two consecutive ones given in a table, we are said to *interpolate* between these two. This is a process which we have very often to carry out, and it amounts to a simple "rule of three" sum. Thus, having given

$$\sin 32° 5′ = ·5311521,$$
$$\sin 32° 6′ = ·5313986,$$

to find sin 32° 5′ 25″.

This work is preparatory to the solution of triangles, and examples will be found in Loney, chap. xi.; Hall and Knight, chap. xv.; H. Smith, chap. xv.; Lock, chap. xv.

The student should not make too much of this, as it is an easy bit of arithmetic. For instance, in the above example we first observe that sin 32° 5′ 25″ is nearer ·5311521 than ·5313986; and as there are 60″ in 1′, sin 32° 5′ 25″ is, so to speak, $\frac{25}{60}$ of the way from ·5311521 to 5313986; hence it is $·5311521 + \frac{25}{60}\cdot0002465 = ·5312631$. The method is the same whether we are dealing with numbers and their logarithms, angles and their sines, cosines, or tangents, or with angles and the logarithms of the sines, cosines, or tangents. But it must be remembered that while a sine or tangent *increases* with the angle (if acute), the cosine *diminishes*.

Solution of Triangles.—For examination purposes it is necessary to be able to prove the formulæ which are used for solving triangles.

Hall and Knight, Arts. 137 to 140, 184 to 186, 189.

Loney, chap. xii., all the formulæ in thicker type.

Lock, Arts. 237 to 245.

H. Smith, Arts. 175 to 184.

The formulæ are here collected:—

1. $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$.
2. $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$.
3. $\tan \frac{A-B}{2} = \frac{a-b}{a+b} \cot \frac{C}{2}$.
4. $\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$.
5. $\cos \frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}}$.
6. $\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$.

The proof of 1 is exceedingly easy; 2 is really the result of Prop. 13, Book II. of Euclid. Unfortunately the proofs of the remaining formulæ depend on results obtained in a section of the trigonometry which the student is not asked to study for Stage 2. However, he must practise the proofs as they are given in the text-books.

Work the following examples, using your own mathematical tables:—

1. Take A = 35°, B = 70°, a = 23·46. Find b. Ans. 38·43.

2. Take B = 42° 15′, b = 9·68, c = 4·23. Find C to the nearest minute. Ans. 17° 6′.

3. Take $a = 6{\cdot}9$, $b = 4{\cdot}7$, $c = 8{\cdot}6$. Find $\sin\frac{A}{2}$, $\cos\frac{B}{2}$, $\tan\frac{C}{2}$, and thus determine A, B, C to the nearest minute.

Ans. ·4476; ·2588; 1·068; 53° 12′; 33°; 93° 48′.

4. Take A = 48° 16′, $b = 9{\cdot}84$, $c = 7{\cdot}26$. Find $\tan\frac{B-C}{2}$, and hence $\frac{B-C}{2}$.

Remembering that $\frac{A}{2} + \frac{B+C}{2} = 90°$, and that therefore $\frac{B+C}{2} = 90 - \frac{A}{2} = 65°\ 52'$, you may now calculate B and C.

Observe that cot 24° 8′ = tan (90° − 24° 8′) = tan 65° 52′.

Ans. ·3367; 18° 36′; 84° 28′; 47° 16′.

Stage 3.

Algebra.

Binomial Theorem.—Hall and Knight, chaps. xiii. and xiv., especially Arts. 163, 166, 167, 170, 173, 174, 176, 182, 186.

Todhunter and Loney, chap. xxxix., especially Arts. 448, 451 (Ex. 3), 454, 456, 457, 458, 460. Read carefully through the worked-out examples.

Briggs and Bryan, chap. xxiii., especially Arts. 326, 330, 331, 335, 336, 337, 339 (Ex. 4 to 8).

Become quite familiar with the following:—

1. The two forms of the binomial theorem—

$$(x+a)^n = x^n + nax^{n-1} + \frac{n(n-1)}{1\cdot 2}a^2x^{n-2} + \ldots$$

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{1\cdot 2}x^2 + \ldots$$

To make use of the latter, be ready to make this sort of change—

$$(x^2+3y)^n = \left\{x^2\left(1+\frac{3y}{x^2}\right)\right\}^n = x^{2n}\left(1+\frac{3y}{x^2}\right)^n.$$

2. The general term, the $(r+1)^{th}$, of $(1+x)^n$ is

$$\frac{n(n-1)(n-2)\ \ldots\ (n-r+1)}{\lfloor r}x^r.$$

Try to realise that by means of this you may write down any term of any binomial expansion, no matter what x, n, and r may be.

3. Without consulting the text-book, give to n such values as −1, −2, −3, etc.; $\pm\frac{1}{2}$, $\pm\frac{1}{3}$, $\pm\frac{1}{4}$, etc.; and write down the $(r+1)^{th}$ term, or some particular term.

Also give to x such values as 1, −1, $\pm\frac{1}{2}$, $\pm\frac{1}{3}$. In fact, play for an hour or two with the expansion for $(1+x)^n$, and practise simplifying the general term. You can learn a vast amount in this way without consulting the text-book.

Work the following:—

1. In the expansion of $(1+x)^n$—

(1) Write down the tenth term when n is 15, −1, −2, $\frac{1}{2}$, and simplify it as much as possible.

(2) What is the sum of the coefficients in $(1+x)^{12}$?

(3) If $x = -\frac{45}{11}y$, and $n = -\frac{10}{3}$, find the third and fourth terms, and the ratio of the fourth to the third. Show that y must be less than $\frac{11}{80}$, if the fourth term is to be less than the third. Show also that under these conditions the terms will get less and less after the third. (See 1899 Day Paper.)

(4) Find the $(r+1)^{th}$ and r^{th} terms, and the ratio of the $(r+1)^{th}$ to the r^{th} if $x = \frac{2}{3}$, and $5n-1$ is put for n. If this ratio is 1, two terms must be equal; which are they? Also, since $5n-1$ represents the numbers 4, 9, 14, 19 . . . by putting 1, 2, 3 . . . for n, which are the two equal terms in the expansion of $\left(1+\frac{2}{3}\right)^{19}$? (See 1899, Stage 3.)

Ans. (1) $\frac{\lfloor 15}{\lfloor n\ 7}x^9$, $-x^9$, $-10x^9$, $\frac{1\cdot 3\cdot 5\ \ldots\ 15}{2^9 9}x^9$;

(2) 2^{12}; (3) $\frac{10\cdot 13}{9\cdot 2}\left(\frac{45}{11}x\right)^2$ and $\frac{10\cdot 13\cdot 16}{27\cdot \lfloor 3}\left(\frac{45}{11}x\right)^3$; $\frac{80}{11}$;

(4) $\frac{2(5n-r)}{3r}$; $2n^{th}$ and $(2n+1)^{th}$; 8th and 9th.

Trigonometry.

Miscellaneous portions.—Hall and Knight, Arts. 125, 126, 135, 253, 254, 256, 257, 316, 317.

Loney, Arts. 107, 110, 111, 113, 120, 124, 127, 129, 133, 173.

Observe that we may find the sum of a series of sines or cosines in which the angles form an arithmetical progression, by multiplying each term by 2 sin (½ common difference of the angles), then resolving each product so formed into a sum or difference of two sines or cosines. For example, take the series—

$$S = \sin a + \sin 2a + \sin 3a + \ldots \sin na.$$
$$C = \cos a + \cos 2a + \cos 3a + \ldots \cos na.$$

$$\text{Then } 2S\sin\frac{a}{2} = 2\sin a\ .\ \sin\frac{a}{2} + 2\sin 2a\ .\ \sin\frac{a}{2} + \ldots$$
$$= \left(\cos\frac{a}{2} - \cos\frac{3a}{2}\right) + \left(\cos\frac{3a}{2} - \cos\frac{5a}{2}\right) + \ldots$$

As all the terms cancel except the first and last, S can easily be found. Similarly C may be found.

Work the following examples:—

1. Show that if the values 0, 1, 2, 3, 4, 5 . . . be given in succession to n, the expression $\cos^2\frac{n\pi}{7}$ will have only *four different* values. Use $\cos^2\frac{\pi}{7} = \frac{1}{2}\left(1+\cos\frac{2\pi}{7}\right)$.

2. Prove that in any triangle

$$\frac{\sin^2 A - \sin B\ .\ \sin C}{a^2 - bc} = \frac{\sin^2 B - \sin C\sin A}{b^2 - ca}.$$

$$c^2 = (a-b)^2\cos^2\frac{C}{2} + (a+b)^2\sin^2\frac{C}{2}.$$

$$(b+c-a)\left(\cot\frac{B}{2} + \cot\frac{C}{2}\right) = 2a\cot\frac{A}{2}.$$

$$rr_a\cot\frac{A}{2} = \text{area of triangle.}$$

3. If a be the side of a regular polygon of n sides, and r and R the radii respectively of its inscribed and circumscribed circles, prove that $R + r = \frac{a}{2}\cot\frac{\pi}{2n}$.

4. Prove that $8\cos^8 A + 8\sin^8 A = \sin^4 2A + 8\cos^2 2A$.

5. Find the greatest possible values of sin A + cos A, and of sin A + $\sqrt{3}$ cos A. Ans. $\sqrt{2}$; 2.

6. Find the sum of the four different values of $\cos^2\frac{n\pi}{7}$ in Ex. 1.

Ans. $2\frac{1}{4}$.

Geometry.

Read Props. 18 to 33, Book VI. Of these, 19, 25, and 31 are probably the most important.

NOTES ON THEORETICAL MECHANICS.

BY F. CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London; Author of "Elementary Practical Physics," etc.

ADVANCED AND HONOURS STAGES.

In these notes the attention of the student has been repeatedly drawn to the importance of numerical exercise work. This tends to give clear notions of fundamental principles, and is, from an examinational point of view, absolutely indispensable.

To be able to readily use any formula or rule which may be required in a given problem is often quite as important as the ability to prove it. Students familiar with the examination papers of the Science and Art Department are already aware of the importance which is attached to numerical work. Such numerical work usually, on those portions of the subject to which reference has been made in these columns, may be found in previous numbers of THE PRACTICAL TEACHER, or may in many cases be easily obtained from any text-book on the subject. The troublesome arithmetical operations of multiplication, division, evolution, etc., can be made much simpler, and easy of application, by a judicious use of four-figure logarithms.

Elasticity of Shape.—The elasticity of shape or rigidity of a body is measured by the ratio of *stress* to *strain*—the word *stress* denoting the *force per unit area*, and *strain* the *alteration in shape* produced by the stress.

Thus, if a rod or wire be suspended from one end, and a load

applied at the other end, the stress will be the ratio of the load to the area of cross section.

$$\therefore \text{ stress} = \frac{\text{load}}{\text{area}}.$$

Accompanying the stress, and produced by it, is a corresponding alteration in the length, the strain being the ratio of the alteration in length to the original length.

$$\therefore \text{ strain} = \frac{\text{alteration in length}}{\text{original length}}.$$

It is found that the strain produced is always proportional to the stress within what is called the *elastic limit*—that is, if a load P produce an alteration of length x, a load 2P will produce a lengthening $2x$, etc.; and on the removal of the load, so long as the elastic limit is not exceeded, the wire regains its original length. As stress is proportional to strain, then stress = E strain, where E is a constant, called the *modulus of elasticity* for the given material.

$$\text{Hence } E = \frac{\text{stress}}{\text{strain}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

E is also generally known as *Young's modulus.*

From (1) it is at once obvious how the value of E for any ordinary material may be determined. Thus a rod or wire suspended from one end and loaded at the other, as the dimensions are known, the area of cross section can be obtained, and therefore the stress is known. By any accurate method of measurement—that is, *verniers*, etc.—the alteration in length can be found, and thus knowing the original length, the strain is known. Hence E, the ratio of stress to strain, can be obtained with some approach to accuracy.

The value of E can also be obtained by noting the deflection of a bar or rod supported at each end and loaded at the centre. If the bar be rectangular of depth d and breadth b, and supported on knife edges at a known distance l apart; then if δ be the deflection produced by a load W applied at the centre,

$$E = \frac{Wl^3}{4\delta bd^3} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

From (2), as all the quantities on the right are known, E can be found.

Ex. 1. (*a*) A rod 12 feet long, with a uniform cross section of 4 square inches, is hung up by one end, and carries a weight of 20,000 lbs. at the other end. It is thereby stretched half an inch. Find the modulus of elasticity.

(*b*) What would have been the elongation if the length of the rod had been 20 feet, and its diameter 2 inches?

(*a*) Here the stress $= \frac{20000}{4} = 5000$ lbs. per square inch, and the strain $= \frac{\frac{1}{2}}{12 \times 12} = \frac{1}{288}$.

$$\text{Hence } E = \frac{5000}{\frac{1}{288}} = 5000 \times 288 = 1440000 \text{ lbs.}$$

(*b*) The area of the cross section will be $\pi \times 1^2 = 3{\cdot}1416$ square inches.

$$\therefore \text{ stress} = \frac{20000}{3{\cdot}1416}.$$

If x denote the elongation, then *strain* $= \frac{x}{12 \times 20}$.

$$\text{Hence } E = \frac{\text{stress}}{\text{strain}}.$$

$$\therefore 1440000 = \frac{\frac{20000}{3{\cdot}1416}}{\frac{x}{12 \times 20}} = \frac{20000 \times 240}{x \times 3{\cdot}1416}.$$

$$\therefore x = \frac{20000 \times 240}{1440000 \times 3{\cdot}1416} = 1{\cdot}06 \text{ inches.}$$

Ex. 2. If the modulus of elasticity is defined as the ratio of longitudinal stress to strain, what is the meaning of the words *stress* and *strain*?

A rod 15 feet long, with a uniform section of 6 square inches, is hung up by one end, and carries a weight of 30 tons at the other. It is thereby stretched a quarter of an inch. Find the numerical value of the stress and strain. (1893.)

Ans. Stress $= \frac{30}{6} = 5$ tons per sq. in.; strain $= \frac{1}{720}$.

Ex. 3. A ship is moored by two cables of 90 feet and 100 feet in length respectively. The first cable stretches $2\frac{1}{8}$ inches, and the second stretches 3 inches, under the pull of the ship. Find the strain on each cable. Ans. ·00243 in.: ·0025 in.

Ex. 4. What is the modulus of elasticity of a substance?

A round bar of iron, 12 feet long and 1·382 inches diameter, is held at one end and pulled by a force until it stretches $\frac{1}{8}$ inch. Find the force, the modulus of elasticity being 3×107.

Ans. 39062·5 lbs.

Tension of a cylinder under internal fluid pressure.—In a closed hollow cylinder, the sides of which are made of some thin material, the pressure of the enclosed fluid will be the same at all points of the sides at the same level.

Let r denote the radius of the cylinder, and l its length; then a plane drawn through the axis of the cylinder and terminated by the two ends will form a rectangle of length l and width $2r$. If we consider the equilibrium of that part of the surface of the cylinder on one side such an imaginary plane, we have the resultant pressure on the curved surface of the cylinder equal and opposite to that on the plane. The resultant force on the rectangle is $p \times$ area of rectangle $= p \times 2rl$, where p denotes the internal pressure.

If t denote the tension per unit length along a generating line of the cylinder, as the length of the cylinder is l, the tension along a generating line will be tl. The imaginary plane passing through the axis will cut the cylinder in two generating lines; hence that part of the cylinder on one side the diametral plane may be taken to be in equilibrium under the action of three parallel forces—that is, the resultant force $p \times 2rl$, and the tensions furnished by two generating lines, $2tl$.

$$\text{Hence } p \times 2rl = 2tl.$$

$$\therefore t = pr. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

If T denote the thickness of the cylinder, and f the tenacity of the material of which the cylinder is made, then the greatest tension at the surface which the material can furnish is given by Tf.

$$\text{Hence } pr = Tf.$$

$$\therefore p = \frac{Tf}{r}. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Ex. 1. If the length of a cylinder is 6 feet, and radius 6 inches, what will be the whole tension along a generating line when the internal pressure is 10 lbs. per square inch?

Here, from (1), $t = pr$, where $p = 10$, $r = 6$.

$$\therefore t = 60.$$

Hence the tension per unit length along a generating line is 60 lbs.

As the length of any generating line is 6×12 inches, $\therefore$ whole tension $= 72 \times 60 = 4320$ lbs.

Ex. 2. A hollow cylindrical vessel is filled with gas at a given pressure. Explain what is meant by t in the formula $t = pr$. Suppose the cylinder to be 4 feet high, and the radius of its base to be 6 inches, what would be the whole tension along one generating line if the pressure of the gas were 4 lbs. per square inch (that is, in excess of external pressure, if any)? (1894.)

Ans. t denotes the tension across unit length of a generating line; 1152 lbs.

Ex. 3. Find the tension of a thin cylinder under internal fluid pressure.

If the internal diameter of a tube is 8 inches, the thickness of the material 0·1 inch, and its tenacity 20,000 lbs. per square inch, find bursting pressure in pounds per square inch. (1893.)

Ans. 500.

Ex. 4. A cylinder closed at both ends is under internal fluid pressure. Consider one of the parts into which the curved surface would be divided by a plane containing the axis; compare the resultant pressure on that part with the pressure on one of the ends. (1896.)

Ex. 5. Two tubes are made of matter of the same thickness, but the tenacity of the one is half that of the other. If the diameter of the former tube is three-eighths of the diameter of the latter, compare the pressures per square inch that would burst them. (1899.)

ELECTRICITY AND MAGNETISM.

NOTES ON ADVANCED AND HONOURS STAGE.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

The Metre Bridge (*Continued*).

Calibration of the bridge wire.—It has already been remarked that it is practically impossible to obtain a piece of wire, a metre or so in length, so uniform in section and constitution that each

centimetre possesses the same resistance. For accurate work it therefore becomes necessary to calibrate the bridge wire—that is, to graduate it in terms of a scale of parts corresponding to equal increments of resistance. This process may be carried out, after the wire has been mounted on the bridge, by the following method, due to Professor Carey Foster :—

A short length of platinoid or manganin wire is soldered at its ends to two copper contact pieces (Fig. 1). This arrangement is termed the gauge wire. The length of the wire is so chosen that its resistance is equal to that of a short length (say about 5 cms.) of the bridge wire. Then our object is to determine a number of consecutive points on the bridge wire, such that the resistance between any two neighbouring points is equal to that of the gauge wire.

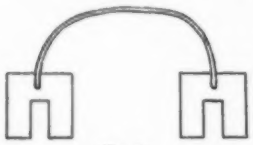


Fig. 1.

Insert the gauge wire in the left-hand end gap, B (Fig. 2), of the metre bridge, and close the other end gap, A, with its copper connecting piece. Take two pieces of platinoid wire, R_1 and R_2, and insert such lengths of these in the interior gaps that the point of equilibrium, D, lies at the extreme left of the bridge wire. Special care must be observed, in order that the binding screws and the wires clamped by them are not heated by contact

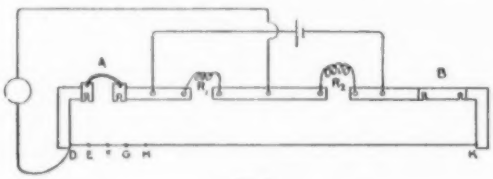


Fig. 2.

with the hand. When the reading of the point D has been recorded, shift the gauge wire from B to the gap A, and place in B the copper connecting piece which previously bridged the gap A. Now find the new point of equilibrium, E, on the bridge wire. Then the resistance of that part of the bridge wire which lies between D and E is equal to the resistance of the gauge wire.

The truth of this statement can be easily proved. When the gauge wire was in the gap B, its effect was to virtually lengthen the bridge wire at the left-hand end. Hence the true distance of the point of equilibrium, D, must be measured, on the left, from an imaginary point somewhere to the left of D; on the right, the distance must be measured from the soldered junction K. When the positions of the gauge wire and the copper connecting piece are interchanged, the effect on the position of equilibrium is the same as if a length of wire had been removed from the left to the right hand end of the bridge wire. As R_1 and R_2 meanwhile remain unchanged, the point of equilibrium is shifted to the right, through a distance corresponding to the resistance of the wire which has been removed.

This may also be proved mathematically as follows :—

Let l_1 = length of bridge wire to the left of D.
" l_2 = " " " right of D.
" l'_1 = " " " left of E.
" l'_2 = " " " right of E.
" λ = that length of the bridge wire in the neighbourhood of D and E which would possess a resistance equal to that of the gauge wire.

Then when the gauge wire is at B, for D to be a point of equilibrium we must have—

$$\frac{R_1}{R_2} = \frac{\lambda + l_1}{l_2}.$$

When the gauge wire is at A, for E to be a point of equilibrium we must have—

$$\frac{R_1}{R_2} = \frac{l'_1}{\lambda + l'_2}.$$

$$\therefore \frac{\lambda + l_1}{l_2} = \frac{l'_1}{\lambda + l'_2}.$$

Add 1 to each side of this equation—

$$\frac{\lambda + l_1}{l_2} + 1 = \frac{l'_1}{\lambda + l'_2} + 1.$$

$$\therefore \frac{\lambda + l_1 + l_2}{l_2} = \frac{\lambda + l'_1 + l'_2}{\lambda + l'_2}.$$

But $l_1 + l_2 = l'_1 + l'_2$ = DK, the total length of the bridge wire. Hence we may divide the left-hand member of this equation by $\lambda + l_1 + l_2$, and the right-hand member by the equal quantity $\lambda + l'_1 + l'_2$. We then get—

$$\frac{1}{l_2} = \frac{1}{\lambda + l'_2}.$$

$\therefore \lambda + l'_2 = l_2$, and $\lambda = l_2 - l'_2$ = the distance between the points D and E.

Hence the resistance of that part of the bridge wire which lies between D and E is equal to the resistance of the gauge wire.

Next replace the gauge wire in B, and the copper connecting piece in A, and diminish the length of the wire R_2 until the point of equilibrium occurs at E. Then interchange the positions of the gauge wire and the copper connecting piece, and determine the new point of equilibrium F. Then, for reasons similar to those just explained, the resistance of the length EF of the bridge wire is equal to the resistance of the gauge wire, and therefore to that of the length DE of the bridge wire.

Proceeding in this manner, we may determine a number of consecutive points on the bridge wire, such that the resistance of that part of the wire between any two neighbouring points is equal to the resistance of the gauge wire.

We must now construct a curve from which we may determine the correct distance of any point of equilibrium from the two ends of the bridge, *measured on a scale of parts corresponding to equal increments of resistance, but not necessarily to equal increments of length.*

The method of constructing such a curve will be seen from Fig. 3. The graduations marked on the metre bridge are plotted horizontally. Let us suppose that the first few positions of equilibrium were as follows :—

D = 0,	G = 16·15,
E = 5·32,	H = 22·05,
F = 10·81,	etc.

We will take the first length—namely, 5·32—as correct. Then we plot 5·32 vertically above the point on the horizontal scale marked 5·32.

Above the third point, F—namely, 10·81 on the horizontal scale—we plot $2 \times 5{\cdot}32 = 10{\cdot}64$. Above G—that is, 16·15 on the horizontal scale—we plot $3 \times 5{\cdot}32 = 15{\cdot}96$. Above H—that is, 22·05 on the horizontal scale—we plot $4 \times 5{\cdot}32 = 21{\cdot}28$, etc.

Proceeding in this manner, we obtain a number of points which may be joined by a continuous curve. If the last point of equilibrium, L, does not correspond with K, the end point on the wire, we may determine the ordinate corresponding to L, and so obtain the point P on the curve, and then produce the curve till it cuts the ordinate corresponding to K.

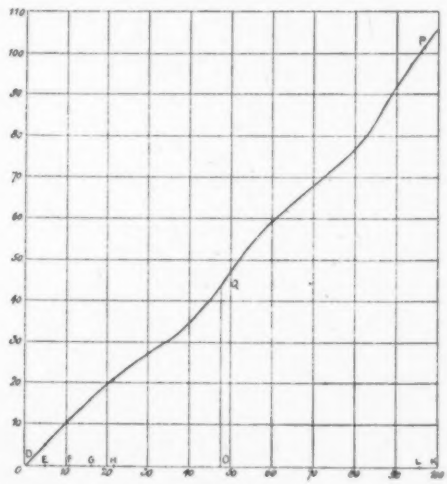


Fig. 3.

In the particular case illustrated by the curve (Fig. 3), the virtual length of the wire was equal to 104·6 cms., that being the ordinate corresponding to 100 on the horizontal scale.

Let us suppose that during an ordinary measurement of resistance the point of equilibrium was at 47·5 on the scale of the bridge. The corrected reading is found to be equal to OQ—that is, 43·0. Hence, if the unknown resistance, x, was in the left-hand interior gap, and the known resistance, R, in the right-hand interior gap, the end gaps being both closed with the copper

connecting pieces, and the corrections for bad soldering at the ends of the wire were negligible, we have:—

For uncorrected value of resistance—

$$\frac{x}{R} = \frac{47{\cdot}5}{100 - 47{\cdot}5} = \frac{47{\cdot}5}{52{\cdot}5} = {\cdot}904.$$

For corrected value of resistance—

$$\frac{x}{R} = \frac{43{\cdot}0}{104{\cdot}6 - 43{\cdot}0} = \frac{43{\cdot}0}{61{\cdot}6} = {\cdot}698.$$

The error committed when an uncalibrated wire is used is not generally so great as in the above instance, but it is likely, nevertheless, to be considerable. Hence the necessity of calibrating the bridge wire, when accurate results are required, becomes sufficiently manifest.

NOTES ON ADVANCED AND HONOURS PHYSIOGRAPHY.

The May Solar Eclipse.—By far the most conspicuous astronomical event of 1900 will be the total eclipse of the sun, which takes place on the twenty-eighth of May. The track of the shadow may readily be followed on a map of the world by means of the following particulars. Beginning on the Pacific coast of Mexico, the track of the shadow crosses the north-western corner of the Gulf of Mexico, and enters the United States at Louisiana, passing thence to North Orleans, and onwards through Mississippi, Alabama, Georgia, and the Carolinas, and reaches the Atlantic at Cape Henry, Virginia, the chief points in the central portion of the route being Columbus in Georgia, Raleigh in North Carolina, and Norfolk in Virginia. The track then crosses the Atlantic, and touches land again at Ovar, in Portugal, fifty miles to the south of Oporto, whence it passes to Elche, near Alicante, on the Mediterranean, where it crosses and meets the African coast at Cape Matifou, near Algiers, and then passing eastward, bisects the province of Tunis, and skirts the coast of Tripoli, by way of the Gulf of Cabes, and finally ends at sundown on the eastern shores of the Gulf of Sidra.

The Astronomer-Royal will be located at Ovar in Portugal, Sir Norman Lockyer will be at Alicante, whilst Mr. Evershed will be at Algiers. It is thus probable that a successful series of observations will be made.

The Origin of Granite.—Mr. A. R. Hunt of Torquay, writing to *Nature* for the twenty-second of February, criticises Lord Kelvin's theory of the formation of granite, which he first of all states as follows:—"Lord Kelvin starts from a period in the earth's evolution when a lava forty kilometres deep covered a solid nucleus. The specific gravity of the liquid lava is assumed to be 2·50. It is also assumed, on what may seem firm grounds, that solid lava would sink in fluid lava, and, on more doubtful grounds, that all minerals crystallising out of lava would also sink. On this assumption the lava ocean silts up, and the surface does not freeze until the forty kilometres of the crust (excepting the future ocean basins) are composed of solid crystals set in an interstitial mother liquor."

The Formation of Continents and Ocean Basins.—According to Lord Kelvin, continents arose from the drifting and unequal distribution of the crystals falling like a snow shower through the lava, the ocean basins arising from the contraction of the mother liquor on cooling. The great objection to this theory is that some at least of the mineral constituents of lava would be lighter than the lava itself, and therefore on crystallising out they would float, and form a non-conducting crust that would effectually prevent the cooling down of the mother liquor.

Another Theory.—Mr. Hunt gives the theory that is held by petrologists, which, although not so ingenious as that of Lord Kelvin, is certainly more probable. It suggests that granite is a plutonic rock formed by the action of heat and moisture and pressure upon previously-existing rocks, which consisted in the first place of those light aluminous soda and potash silicates which first consolidated on the surface of the primeval lava ocean. To these silicates it is only necessary to add water to have present all the constituents of muscovite granite. Moreover, the soda may be omitted, as the constituents of muscovite (K_2O, $2H_2O$, $3Al_2O_3$, $6SiO_2$) are simply leucite (K_2O, Al_2O_3, $4SiO_2$) and water. Introduce sodalite, an even more likely constituent of the primeval crust than leucite, and we have all the materials needed for ordinary granites. This, as the writer observes, is, if only a hypothesis, at least a workable one, which is more than can be said of Lord Kelvin's more ingenious theory.

Decline of Geyser Action in Yellowstone Park.—The famous geysers in Yellowstone Park, Wyoming, are becoming much less active than was formerly the case. Professor Barbour, after an interval of four years, finds that the Fountain geyser, the grandeur of which may be inferred from the fact that a hotel was built near it, is now extinct. The Cascade has diminished its eruptions from one in fifteen minutes to one in twenty-four hours. The Grand geyser, which formerly had an eruption every day, was active only three or four times during the whole of last season; and even Old Faithful, although still wonderfully active, has increased the interval between two successive outbursts from one hour to seventy-five minutes. In fact there appears to be a general decrease in eruptive energy throughout the whole area, except, perhaps, with respect to the mud geysers.

Temperature of the Surface Waters of the Sea.—Mr. Dickson communicates some valuable data under this head to the Meteorological Society. (*a*) *Daily range.*—On the west coast this is 0·7°, whilst on the east and in the North Sea it is 0·8°. (*b*) *Average temperature.*—At the entrance to the English Channel this is 54°; in south-east Ireland, 52°; along the north coast of Ireland and west coast of Scotland to Stornoway, 49°; off the coast of Norfolk and Suffolk, 48°; off the Orkneys, 41°. (*c*) *Temperature of air and sea.*—A comparison of the mean annual temperature of air and sea shows that the mean excess of air over sea never exceeds 2°, whilst off the east coast of Scotland it is only 0·5°, and is even less still on the east coast of England.

Metamorphic Rocks in Tyrone and Donegal.—A paper on this interesting subject was lately communicated to the Royal Irish Society by Professor Cole. The gneissic axis north of Pomeroy is shown to be invaded by granite of the Slieve Gullion type, and the metamorphism of the central region thus in all probability occurred before the Caledonian earth movements. The gneiss itself rarely shows the effect of pressure, its structure being apparently due to the invasion of basic schists by granite at some early period. The large area west of Pettigoe, in West Donegal, shows similarly a foliated granite (the archæan gneiss), which owes most of its foliation to the inclusion and streaking out of masses of pre-existing amphibolite. Bands of micaceous rock are formed from the absorption and metamorphism of garnet pyroxenites and garnet amphibolites. The latter rocks may have been sedimentary, and are now found as great eyes and lenticels, round which the pure white gneiss flows, and into which it sends off veins. As in some French districts, the metamorphic area of eastern Donegal shows the effects of igneous intrusion and contact metamorphism on a regional scale, and dynamic metamorphism has played but a minor part in determining its structures.

Work by the Kite Meteorograph.—The United States Weather Bureau at Washington has just issued a *resumé* of the facts observed by Frakenfield in the course of his kite observations. He found that the mean rate of temperature diminution with increase in height, as determined by 1,217 ascents to 1,000 feet or more, was 5° for each 1,000 feet. The steepest gradient—namely, 7·4° per 1,000 feet—was in the first 1,000 feet, after which there was a steady decrease up to 5,000 feet, the rate becoming less as the altitude decreased. Up to 5,000 feet the decrease was 3·8° per 1,000 feet; above this altitude there is apparently a tendency to a slow rise. The relative humidity at and above the surface of the earth differed only slightly, except at 7,000 feet, where there was a difference of 11 per cent. between the lower and the upper areas. The mean result of all the observations showed 60 per cent. at the surface and 58 per cent. above, a difference of only 2 per cent.

A Remarkable Meteor.—Three independent observers wrote recently to *The Times* concerning a brilliant meteor that was seen at about 3 p.m. on the afternoon of January 9. Writing from Lewes, Mr. Bouverie says:—"Whilst shooting here today I saw a brilliant meteor which started from near the moon, that was quite bright at the time; it travelled for a short distance towards the north-east, and left a marvellously luminous path of white light. The time of the appearance was as near 2.55 p.m. as possible. I never heard of such a thing being seen in broad daylight." Another observer writes as follows from Reigate:—"At 2.55 p.m., in brilliant sunlight, a remarkable meteor was seen by a party of five from Reigate Heath golf ground. The course of the meteor was south to north, and it traversed a considerable portion of the heavens. In appearance it resembled a kite, with a tail of a luminous white colour. It was visible for about a second." Writing from The Drive, Brighton, the Rev. R. Hudson writes:—"The colour was brilliant white, like an incandescent gas light. There was a nucleus and tail of considerable length. The altitude was about half that of the moon, which was visible at the same time. The sky was cloudless and blue, and the sun was shining brightly at the time. The general effect was that of the falling stick of a rocket, and, indeed, my first impression was that it was a peculiar daylight rocket; but a moment's consideration of the direction of flight convinced me that it was a very remarkable meteor."

Earthquakes in Japan.—An Earthquake Investigation Committee has been for some years sitting in Japan, by whom much valuable information has been collected from historical records. It appears that between the years 416 and 1867 no less than 1,898 earthquakes had been recorded. Of these, 220 had been of a destructive character, so that Japan may apparently expect a seismic catastrophe once every two and a half years. Destructive shocks are most numerous during the months of July and August, when the ordinary shocks are least frequent. The explanation given by Professor Omdi is that the constant recurrence of small earthquakes maintains the disturbed region in a safe condition, thereby preventing any abnormal accumulation of stress in the earth's crust. It also appears that the provinces on the Japan Sea, or concave side of the islands, were disturbed almost entirely by local shocks; while those on the convex or Pacific side were often disturbed by great non-local ones, the origins of which were situated beneath the ocean, and sometimes caused fearful sea-waves.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
First Class Honoursman in Chemistry.

Molecular Weight of Gaseous Sulphur.—Herren Bleier and Kohn have been working on sulphur vapour at very low pressure, their aim being to work at such a pressure as would make dissociation impossible. In this they have not been completely successful, as they found that even with a pressure of 2·1 mm. of mercury the molecular weight found was 251 instead of 256, corresponding to a molecule of eight atoms. The results obtained, plotted in a curve, however, furnished convincing proof of the fact that the molecule of undissociated sulphur vapour consists of eight atoms, which agrees with the conclusions arrived at by the application of the freezing-point and boiling-point methods to sulphur solutions.

Iceland Spar as an Acid Standardiser.—In *The Chemical News* for the sixteenth of February, Dr. Masson discusses the various methods of obtaining a reliable standard solution of acid. We strongly recommend our readers to study this article, as the process commends itself to us as not only simple but as equally reliable. The method is as follows:—One or more pieces of Iceland spar, weighing about three grams, are placed in a clean dry beaker, and the whole is then accurately weighed. The beaker is then covered with a watch-glass, and exactly 20 c.c. of HCl are run in from a burette, care being taken that there is no spilling. The covered beaker is then left till the evolution of gas has ceased, which is the case in about three or four hours. The cover and sides of the beaker are then rinsed down with a little distilled water, the cover is replaced, and the beaker raised to the boiling-point and kept at that temperature for about an hour, by which the CO_2 is driven off and the reaction is completed. After the hour's heating, the perfectly clear and neutral calcium chloride solution is decanted off, and the beaker and its contained residual spar (still in compact lumps) are thoroughly washed with distilled water, dried at about 100°, cooled, and weighed. The difference between the original and final weighings gives the weight of Iceland spar dissolved by, and exactly equivalent to, the 20 c.c. HCl. It also gives by direct reading the "factor" of the acid, or the ratio of its true strength to the indicator by exact normality; for the usual weight of $CaCl_2$ is 100, and therefore 20 c.c. of a strictly normal acid should dissolve exactly 1 gram. If it is found to dissolve 1·0117 grams, it is 1·0117 times normal. If it dissolves 0·9907 grams, it is 0·9907 times normal. Dr. Masson discusses all probable sources of error, and concludes that Iceland spar is more promising as a standardiser than any substance in common use—an opinion in which we venture to participate.

To dry Crystals.—Mr. F. H. Gelman, F.C.S., writing to *The Chemical News* for the twenty-third of February, describes a very neat method for the drying of crystals, which is likely to replace the old method of drying on clay porous tiles. The apparatus consists of a porous pot pierced at the bottom with a hole, capable of carrying a small cork bored and fitted with a delivery tube, the mouth of the pot being also corked with a cork carrying a delivery tube. The pot is placed in a horizontal position, the glass delivery tubes being supported by the sides of a box. One of these tubes is connected with a drying tube, the other with an aspirator. If it is advisable to use warm air, a tube is inserted between the drying U-tube and the porous pot. The pot containing the crystals is turned from time to time, in order to expose a fresh layer of crystals to the air, and it is easy to see that a speedy and effectual drying will result from the use of Mr. Gelman's ingenious little device.

Electricity and Chemistry.—To the issue of *Nature* for the first of March, Mr. F. Mollwo Perkin contributes an admirable article upon the work done by electricity in chemistry. He alludes to the fact that Sir Humphrey Davy in 1808 discovered sodium and potassium by the electrolysis of their moist hydroxides, and goes on to state that to-day we have returned to this process for the preparation of these metals.

Faraday's Laws.—In 1833 Faraday formulated his laws of electro-chemical deposition—namely: 1. The amount of any substance liberated is proportional to the total quantity of electricity passed through the solution; 2. The amount of different substances liberated by the same quantity of electricity is in the ratio of their chemical equivalents. Bearing these laws in mind, it is astonishing that electricity is not more in use in chemical laboratories, especially as laboratories in foreign countries fail to make full use of this potent chemical agent.

Pure Copper.—Mr. Perkin goes on to state that pure copper can hardly be obtained by furnace methods. How necessary it is that pure copper should be obtained is patent from the fact that the smallest amount of impurity has a very deleterious effect upon the conducting power of copper, which is obtained pure by electrolysis in the following simple way:—The copper, which has been cast into bars or plates, is placed in a bath of copper sulphate connected with an electrical machine as the anode, a plate of pure copper forming the cathode. On the current being passed, the copper at the anode dissolves, and is deposited on the cathode in pure condition, the impurities—consisting of gold, silver, antimony, arsenic, etc.—dissolving in the bath, or remaining on the anode as a sponge, and finally falling to the bottom as anode sludge. Weldless copper tubing is made in the same way, and *mutatis mutandis* iron is galvanised by zinc in the same way, whereby much expense and trouble are saved.

Aluminium.—This metal owes much to electricity. It was discovered by Wöhler in 1837, who obtained it as a grey powder by heating Al_2Cl_6 with potassium. Bunsen, in 1856, prepared it by the electrolysis of the double chloride of aluminium and sodium; whilst two years previously Deville had prepared it by the action of sodium on this same double chloride, the price of the metal being £5 per lb. on account of the high price of sodium. In 1888 the price had fallen to £2 per lb., and was destined to fall much lower; for in this year the Netto-Castner process for the manufacture of sodium by electrolysis was discovered, and the price of sodium was in consequence very greatly reduced, and aluminium now was sold at 15s. per lb. The price to-day is 2s. per lb., and it requires only an increased demand for the metal to further reduce its price.

Acetylene Gas.—This brilliant illuminant, of which more will be heard as time goes on, is the gift of electricity, for it is the cheap preparation of calcium carbide from limestone and coke in the electrical furnace which Moissan has utilised so ingeniously that has made the cheap production of acetylene possible, it being only necessary to place the carbide in water to obtain a copious supply of acetylene: thus—

$$CaC_2 + H_2O = H_2C_2 + CaO.$$

Gold Extraction.—In the M'Arthur-Forrest cyanide process for obtaining gold from the tailings a double cyanide of gold and potassium is obtained, from which gold is precipitated by means of metallic zinc, the gold so obtained having to be refined and purified.

By the Siemens-Halshe process the cyanide solution is electrolysed by means of weak currents, the gold being deposited in a purer form than when deposited by means of zinc. In this process the anodes are of iron, and the cathodes, in which the gold is deposited, are of lead; an amalgam of gold and lead being obtained, from which the former is obtained by cupellation. By this method not only is the gold obtained purer, but the quantity of cyanide used is much less than in the original cyanide process.

Purification of Sn.—The metal obtained from American sources often contains appreciable quantities of gold. A very neat method for separating the tin from the gold has very recently been patented. The tin containing the gold forms the anode in a bath of sodium sulphide, the cathode being a strip of pure tin. On the current being passed, the tin at the anode dissolves, forming a thin salt, from which it is deposited pure on the cathode. The gold and other impurities hang on the anode in spongy form, or fall to the bottom as anode sludge, from which the gold is readily extracted.

General Results.—By using either the electric furnace or by electrolysis, it is now possible to obtain by electricity practically all the metals from their oxides or salts. For example, chromium is obtainable by acting upon the sesquioxide with aluminium in an electric furnace; magnesium by the electrolysis of fused carnallite; and yttrium, lanthanum, cerium, by the electrolysis of their fused chlorides.

CLOUGH'S
Correspondence College

TEMPLE CHAMBERS, LONDON, E.C.

P. T. CLASSES.

New Classes for October 1900, and April 1901, will commence April 14. Names should be entered at once.

SCHOLARSHIP, Dec. 1900.

Every Scholarship Candidate who wishes to do well at the Examination next December should join this Class. Write immediately for Prospectus and full particulars, and note

REMARKABLE RESULTS.

Valuable Scholarships and Exhibitions (£50, £20, £10, etc.) for Successful Students.

CERTIFICATE.

A New Class in preparation for the First Year Certificate Examination, July 1901, will commence on May 1. Early application is necessary.

For prospectus, plan, terms, entry form, and full particulars of above Classes, write to

Mr. G. B. CLOUGH, Temple Chambers, LONDON, E.C.

OUR COMPETITION PAGE

OUR FRENCH PRIZE COMPETITION.

Prize Editor—W. T. THOMPSON, B.A. (LOND.), *French and German Honours.*

RULES.

1. All translations should be **posted not later than April 8,** and addressed:—*Prize Editor*, Office of THE PRACTICAL TEACHER, 33 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. No competitor may take the prize offered more than once in three months.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Plusieurs philosophes rapportent généralement à l'amour-propre toute sorte d'attachements. Ils prétendent qu'on s'approprie tout ce que l'on aime, qu'on n'y cherche que son plaisir et sa propre satisfaction, qu'on se met soi-même avant tout; jusque-là qu'ils nient que celui qui donne sa vie pour un autre le préfère à soi. Ils passent le but en ce point; car si l'objet de notre amour nous est plus cher sans l'être, que l'être sans l'objet de notre amour, il paraît que c'est notre amour qui est notre passion dominante, et non notre individu propre; puisque tout nous échappe avec la vie, le bien que nous nous étions approprié par notre amour, comme notre être véritable. Ils répondent que la passion nous fait confondre dans ce sacrifice notre vie et celle de l'objet aimé; que nous croyons n'abandonner qu'une partie de nous-mêmes pour conserver l'autre; au moins ils ne peuvent nier que celle que nous conservons nous paraît plus considérable que celle que nous abandonnons. Or, dès que nous nous regardons comme la moindre partie dans le tout, c'est une préférence manifeste de l'objet aimé. On peut dire la même chose d'un homme qui, volontairement et de sang-froid, meurt pour la gloire: la vie imaginaire qu'il achète au prix de son être réel est une préférence bien incontestable de la gloire, et qui justifie la distinction que quelques écrivains ont mise avec sagesse entre l'amour propre et l'amour de nous-mêmes. VAUVENARGUES.

RESULT OF THE MARCH COMPETITION.

French.

The prize is awarded to "Immerito," the pseudonym of Henry Hanford, B.A., Eastlea, Teddington.

First Class.—Polly, Chemineau, Sangrado, Agaznog, Buller (Herne Hill), Pearl, Annette, Gaudeamus, Mosaic, La cigale, Gutiger, Piocheur, Professeur, Ghislaine, Ashdown, Sphinx, Anastasia, Des Roches, Eothen, Echo, Gil Blas, Fog, Œdipus, Rex, Vigornian, Redgauntlet, Dies, Manu forti, Kettering, L.N., Français, Rustica, Sinjunalis, Trac, Arlésienne, Spes, Exile, Sarah Gamp, Perette, Sculpin, Sagax, Quince, Carronade, E.S., Smoke, Langton, Cuckoo, Ajax, Robin, Eblana, Constance (Herne Bay), Nell, Tolpan, Thistle, Automobile, Jean Racine, Avoine, Torridge, Forward, Rosa, Marzavan, La Brousse, Lunette, A Plymothian, Bonne chance, Elise, Rioghail, Bede S.S., Saniuqua, Snowdrop, Anchor, May, Poulton, Cygnet, C.E.M., Dum spiro spero (Camden Town), Crockitwuds, Jack Sprat, E.A.N., Carpe diem, Nemo, Sergeant, Gwlad, Flos, Merle, Veronica, Penstrowedd, Braxet, Une petite femme, Allez, Sheila, Mafeking, Dargate, Specimen, M.L.M.B., Nollo, Victory, W.M.E., Marie-Antoinette, Anywl, Gariad, A schoolboy, Fitzthomas, Dei donum, Endor, Ravenscraig, Sigma, Ta Donnochaidh, Comus, Mercredi, Kythé, Marion, Newnorb, Juvenile, La poupée, Violet, Hope, Wynberg, Barrelli, M.A.G., Specs, Mardi gras, J'espère, Sardius, Constance (Hapton), Chopine, Hermann, Paardekraal.

Second Class.—Cicero, Uranie, Boadicea, Hat, Daisy, Tor royal, Le cercle, Buffana, Gipsy, Seiznem, Non scoraggiato, Cæsarea, Khaki, Katrina, Roberts-Kitchener, Lian, Meenie, Novice, Marie I., Espérance, F.M.I., Pretoria, A.W.L., Suspinul, Hyacinth, Richelieu, Yes, Castor, Tigris, Athelstan, Venus, Rosine, Thor, Blossom, Dodo, Kingston, Decem, Jack, Kirkbean, Ludo, Jupiter, Josie, Buller (Guernsey), Ultimathulæ, Ward, Joe's friend, West, Emma, Hopeful, Dum spiro spero (Edinburgh).

Third Class.—Trial, Malvoisin, Swellson, From Olive.

Report.

In contrast with last month, the number of competitors is quite a record number. Over one hundred and eighty competed. The reason for this great variation in the number of papers received is probably that which I suggested in my remarks of last month. A large number of fairly-correct translations was received. The expression *bien des Espagnols* was a puzzle to a large number, who translated *bien* as an adverb modifying *imitant*. A fairly large number, in translating *j'en avais, pour ainsi dire, un sac tout plein*, dropped the metaphor, and yet translated *pour ainsi dire*. A specimen of the kind of translation I mean is, "I had, so to speak, a large number of them." *Pour ainsi dire* is only required as a kind of apology for the introduction of the metaphor, and should not be translated if the metaphor is dropped. Many candidates cannot distinguish between the uses of "would" and "should."

French Prize Translation.

I dignified my name by the addition of the title of "Don," in imitation of the many plebeian Spaniards who, when out of their own country, unceremoniously take this title of honour. Thus I unblushingly had myself styled "Don Raphael," and soon ingratiated myself with the principal lords, who, in their turn, presented me to the Grand Duke.

I bent my energies to the task of studying and paying court to this prince, and was fortunate enough to please him. I listened attentively to all that the oldest courtiers said to him, and by the aid of their conversation I unravelled his disposition. I observed, among other things, that the prince was fond of jests, good stories, and witticisms. Upon this I moulded my course of action. Every morning I wrote down on my tablets the stories I intended to tell later in the day. Of stories I had great store, having, so to speak, a bag cram-full of them.

Nevertheless, it was useless for me to husband my stock, for my bag grew empty, little by little; so that in the end I should have been obliged either to repeat myself or let it be seen that I had come to the end of my apothegms, had not my fertile genius for fiction kept me abundantly supplied. So I invented gallant and humorous tales, which were a great source of diversion to the Grand Duke; and, as often happens to professional wits, I used to set down in my notebook in the morning the witticisms which in the evening I would bring out as impromptus.

"IMMERITO."

JUST PUBLISHED.

SPLENDID NEW WALL SHEETS.

ANIMAL PHYSIOLOGY. Ten Sheets. Printed in Full Colours on dark background, with description of Diagrams, on strong Manilla paper. Size of Sheets, 34 in. by 30½ in. The set mounted on one roller. Price 20s.

WALL ATLAS OF BIBLE LANDS. (*Being No. 4 of Nelson's Royal Wall Atlases.*) Seven Maps. Printed in Colours on strong Manilla paper. Size, 40 in. by 30½ in. The set mounted on one roller. Price 15s.

THOMAS NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

(Several Competitors were disqualified under Rule 2 this month.)

BURNS & OATES' EDUCATIONAL BOOKS.

GRANVILLE READING BOOKS.

Adopted by the London School Board, the Irish National Board of Education, and other School Boards, Home and Colonial. An Illustrated Series of Reading Books, designed to meet the latest requirements of the new Code in *all* Schools.

They are carefully graduated, interestingly written, well illustrated, strongly bound, and form one of the *Cheapest Series of Readers* yet published. All cloth, illustrated.

PRIMER.	32 pp.	2d.	STANDARD III.	208 pp.	10d.
INFANT READER.	64 pp.	4d.	,, IV.	240 pp.	1s.
STANDARD I.	144 pp.	6d.	,, V.	336 pp.	1s. 3d.
,, II.	160 pp.	8d.	,, VI.	382 pp.	1s. 6d.

THE GRANVILLE QUARTERLY EXAMINATION BOOKS.

(To meet the Latest Requirements.)

Ruled for Four Quarterly Examinations, with headings on each page. Foolscap folio, size 13 by 8½, to be had in five styles of rulings. 1s. per dozen. *Specimen copies free.*

THE GRANVILLE HISTORY READERS. THE GRANVILLE POETRY BOOKS. THE GRANVILLE ATLAS.

Illustrated Prospectus and full particulars post free on application.

Approved by the Science and Art Department.
Adopted by the London School Board.

CARROLL'S PRACTICAL GEOMETRY.

For Science and Art Students. By JOHN CARROLL, Art Master, Hammersmith Training College.

40th Edition. With an Appendix to meet all the Requirements indicated in the latest Syllabus of the subject. Strongly bound in cloth, 1s. 6d.

KEY TO EXERCISES on the Orthographic Projection of Points, Lines, Planes, Solids, and Simple Figures in the above, strongly bound in cloth, 1s. 6d.

KINDERGARTEN MATERIALS.

To meet the requirements of the Code, Messrs. BURNS AND OATES have acquired special facilities for supplying Schools with the above on the very best terms. The quality of the articles can be depended upon, and specimens can always be seen in their Scholastic Department.

Materials of every description required can be procured from any of the Publishers on the shortest notice, and supplied on the best terms. *Catalogues free on application.*

Manuscript Books, Note Books, Ruled Foolscap, Drawing Books and Papers, Drawing Pencils, Slates, Slate Pencils, Pens, Penholders, Ink, etc., etc.

School and College Furniture, and General Education Apparatus.

Catalogue of School Books, Stationery, and General School Supplies post free on application.

BURNS & OATES, Ltd., 28 Orchard Street, LONDON, W.

CAMBRIDGE UNIVERSITY PRESS.

CAMBRIDGE SERIES FOR SCHOOLS AND TRAINING COLLEGES.

General Editor—W. H. WOODWARD, of Christ Church, Oxford, Principal of University (Day) Training College, Liverpool, and Lecturer on Education in Victoria University.

Adapted for Use of Candidates for Certificate Examinations of Education Department.

THE MAKING OF CHARACTER: Some Educational Aspects of Ethics. By JOHN MACCUNN, Balliol College, Oxford; Professor of Philosophy in University College, Liverpool. Crown 8vo. [*Ready April 2.*

Specially suited for Candidates for Queen's Scholarship Examinations, December 1900, and Certificate Examinations, July 1900.

A SHORT HISTORY OF THE EXPANSION OF THE BRITISH EMPIRE, 1500-1870. By WILLIAM H. WOODWARD. With Maps. Crown 8vo, cloth, 4s.; cloth extra, gilt top, 5s.

Athenæum.—"Thoroughly to be recommended."

Educational Times.—"Mr. Woodward tells this story *in usum scholarum* in an altogether admirable manner."

School World.—"It is full of wisdom applicable to our own day."

GEOMETRICAL DRAWING. With Notes and Examples. Part I. Plane and Elementary Solid. By W. H. BLYTHE, M.A., Jesus College. 2s. 6d.

Extract from Preface.—"This book is intended for Candidates reading Geometrical Drawing for the Science and Art Department, South Kensington, Elementary Stage, for entrance to Sandhurst and Woolwich, and for the Cambridge Preliminary and Junior Local Examinations.

"Part I. contains Plane Geometrical Drawing and Solid Geometry so far as it is included in the Syllabus, Geometrical Drawing (Art), Subject 1 A, page 231, Science and Art Directory, 1899."

GEOMETRY FOR YOUNG BEGINNERS. An Introduction to Theoretical and Practical Geometry. By F. W. SANDERSON, Head-master of Oundle School. 1s. 4d.

Journal of Education.—"We have read this little book with interest and pleasure, and feel sure that it will prove a most useful introduction to theoretical and practical geometry."

*** *Cambridge Editions of Caesar, Vergil, and Xenophon.*—The attention of Schoolmasters is called to the fact that there are now two editions of some of the works of these authors in the *Pitt Press Series* and the *Cambridge Series for Schools and Training Colleges.* The Editions in the *Cambridge Series for Schools and Training Colleges* have *Complete Vocabularies.* If, in ordering, the Edition required is not specified, the *Pitt Press Edition*, without vocabulary, will be sent.

The following Editions have COMPLETE VOCABULARIES.

CAESAR.—Gallic War, I. (1-29), II., III., IV., V., VI. Edited, with Introduction, Notes, and Complete Vocabulary, by E. S. SHUCKBURGH. 1s. 6d. each.

VERGIL.—Aeneid, I., II., V., VI., IX., and **XII.** Edited, with Introduction, Notes, and Complete Vocabulary, by A. SIDGWICK, Reader in Greek in the University of Oxford. 1s. 6d. each.

XENOPHON.—Anabasis, II., III., IV., and **V.** Edited, with Notes and Complete Vocabulary, by G. M. EDWARDS, Fellow and Classical Lecturer of Sidney Sussex College, Cambridge. 1s. 6d. each.

OVID.—Selections from the Tristia. For the Use of Middle School Classes. Edited, with Notes and Vocabulary, by H. F. MORLAND SIMPSON, Rector of Aberdeen Grammar School, formerly Scholar of Pembroke College, Cambridge. 1s. 6d.

School Guardian.—"Exact and scholarly, and at the same time simple, text-books. The University Press are to be congratulated upon having secured as editors such eminent scholars: their names are a guarantee of their work. These text-books will find their way into numberless preparatory schools and lower forms of public schools; they deal so thoroughly and clearly with the subject in each case that nothing better could be desired by master or pupil. Among others, there is this immense advantage: each volume is its own note-book and dictionary; the student, however elementary his knowledge, needs only the book in hand and a simple grammar."

London: C. J. CLAY AND SONS, Cambridge University Press Warehouse, Ave Maria Lane.

THE EDITOR'S TABLE

THE LAST CODE OF THE CENTURY.

SIR GEORGE KEKEWICH'S latest budget of "must's and shan't's," wherein is to be found the spirit of sweet reasonableness betokening alike the sympathetic heart and the discerning mind, will be no terror for the knights and dames of the chalk and duster, in which respect it compares most favourably with its predecessors, many of which breathed the spirit of mistrust and suspicion savouring of the Philistine who, in his heart of hearts, said of both education and educators, Let them be anathema! What does it matter if there is to be a little less money to some schools—especially as there is likely to be a little more to those which need it most—when we have signs and tokens of the banishment to outer darkness of the commercial educationist, with his sixpence for drawing, his shilling for cookery, and his half-crowns for this or that subject? Is it not handsome compensation that there is to be henceforth and for ever practically no grant fluctuation, seeing that the inspector can only reduce the grant to the extent of one shilling per head, let the deficiencies be what they may? It may be asked what, under this khaki code (for all things are khaki nowadays), is to be done with incurably inefficient schools? The answer is not far to seek. Let them be improved off the face of the earth! This is the logical corollary to the new departure, which we now hasten to place before our readers.

The Block Grant.—All grants for special subjects are now abolished, and "a grant of seventeen shillings or sixteen shillings is made to infant schools and classes," whilst "a principal grant of twenty-two shillings or twenty-one shillings" is to be paid to schools for older scholars.

Conditions to be fulfilled.—In order that the Inspector may recommend the higher grant, he must be satisfied as to (*a*) The suitability of the instruction to the circumstances of the children and of the neighbourhood; (*b*) The thoroughness and intelligence with which the instruction is given; (*c*) The sufficiency and suitability of the staff; (*d*) The discipline and organisation. These conditions are applicable alike to schools for infants and for older children.

Courses of Instruction.—The old bewildering nomenclature of obligatory and optional subjects, to be taken in homeopathic doses by individual children on the one hand, and by classes in their corporate capacity on the other, has gone by the board, and in its place we have a plain, unvarnished tale, as follows:—

Infant Schools.—1. Suitable instruction in the elementary subjects; 2. Simple lessons in common things; 3. Appropriate and varied occupations; 4. Needlework (or drawing for boys); 5. Singing and physical exercises.

For Older Scholars.—1. English, by which are to be understood reading, recitation, writing, composition, and grammar, in so far as it bears upon the correct use of language; 2. Arithmetic; 3. Drawing for boys; 4. Needlework for girls; 5. Lessons (including object-lessons) on geography, history, and common things; 6. Singing, which should, as a rule, be by note; 7. Physical exercises. The whole of these seven subjects should be "taken, as a rule, in all schools," but "it is not necessary that all these subjects should be taught in every class;" moreover, "one or more of them may be omitted in any school which can satisfy the Inspector of the Department that there is good reason in its case for the omission." Further, "for the purposes of Section I. (1) (*a*) of the Technical Instruction Act, 1889, reading, writing, and arithmetic are obligatory as standard subjects."

Freedom.—"The instruction should be in accordance with a syllabus which must be produced to the Inspector at his visit. The Inspector may disapprove any part of the syllabus which he considers unsuitable."

As a result of this, Schedule II. (Class Subject Schemes) only remains in force until March 31, 1900, and, as a help, "specimen schemes of instruction suited to schools in various circumstances may be obtained on application to the Department."

And Responsibility.—"In reporting upon the sufficiency and suitability of the staff, the Inspector will have regard to the fitness of each teacher for the work allotted to him (or her)."

What about Specifics?—These are to be found in their usual order, and it is now laid down that "one or more of these is to be taken when the circumstances of the case, in the opinion of the Inspector, make it desirable."

Other Subjects.—Cookery, laundry work, dairy work, and household management may still be taken by girls, and cottage gardening and manual instruction by boys, for which subjects an additional grant is, as heretofore, made. With respect to the last-named subject, it is laid down that "where manual instruction is taken, it is desirable that suitable occupations leading up to it should be taken in the lower classes," and "the number of children receiving practical instruction from one teacher at any one time should not exceed twenty-four" (Schedule XVII.). As regards cookery, it is required that "for any school year ending after March 31, 1901, it will be a condition of this grant that each girl has spent not less than fourteen hours in attendance at demonstration lessons."

Housewifery.—"If a scheme of practical instruction for girls in household management, including cookery, laundry work, and practical housewifery, is submitted to and approved by the Department, a grant at the rate of seven shillings per hundred hours' attendance may be made for each girl who, while receiving instruction in the elementary subjects in Standard V. or any higher standard, has attended lessons given in accordance with the scheme." Not less than a hundred hours' instruction may be given per annum. Premises must be suitable, and the course may be spread over two or more years.

When the Changes Operate.—All the above changes apply only to schools whose school year ends *after March 31st, 1901*. In all other cases the Code of 1899 will have force.

Pupil Teachers.—Although the changes in this particular are not sweeping, yet Sir George shows us that he remembers the Departmental Committee and its wise recommendations. In the first place, the new Schedule V. is now imperative upon all teachers; but "pupil teachers admitted from the 1st January, 1900, or any earlier date, and pupil teachers admitted for four years under Art. 41 (*e*), will take in their first, second, and third years the examinations prescribed by the Schedule for candidates, first and second year's respectively."

A Questionable Step.—In a new article we behold the creation of yet another class of assistant teachers. "Persons who have completed an engagement as pupil teachers, but have failed at the Queen's Scholarship Examination during their engagement, may, on the special recommendation of the Inspector, be recognised as provisional assistant teachers during the two years immediately succeeding the last two examinations taken by them during their engagement, and after obtaining a satisfactory report from the Inspector, may attend the Queen's Scholarship Examination once again at any time during these two years, notwithstanding the provisions of Article 48 (*d*)."

We question the wisdom of this step; for if a candidate has not sufficient ability to pass the Scholarship Examination after two attempts, he is not very likely to do more than scrape through at the third try, and is certain to swell the already too great number of teachers who are not, and who have no desire to become, scholars. In other words, this new regulation is calculated to further increase the number of unqualified teachers, for to be a scholar is a necessary qualification in one who aspires to be a teacher.

A Second will do.—Quite otherwise is the recognition, now for the first time accorded, of a pass in any class at the London, Victoria, and Welsh University Matriculation Examinations, any time after January 1, 1898, as qualifying for admission into a training college. The Department should now go one step further, and accept portions of the work necessary for these examinations in lieu of the three years' pupil-teacher work, and so make straight the path of the pupil teacher to a university degree. It is somewhat inconsistent that the Department should in the same breath, as it were, declare that the teacher should be a graduate, and that an ignoramus will be acceptable as a *pis aller*. It is to be noted that the certificates of the Central Welsh Board are now included amongst the university qualifications accepted by the Department in place of the ordinary Departmental examinations.

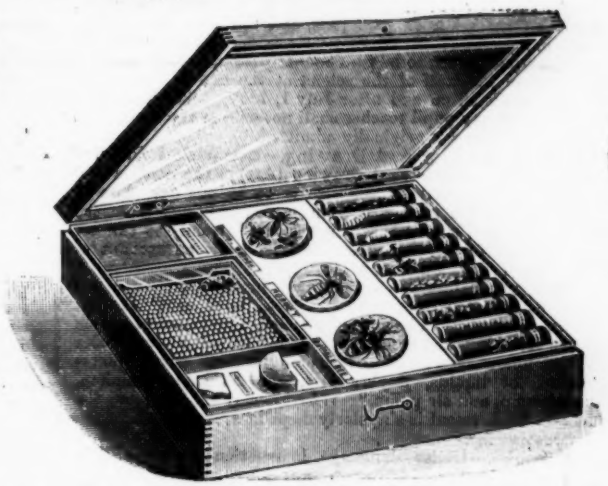
The candidate for admission to a training college may now defer entrance for a year; as for the future, he may be admitted

THE "A.L." NATURAL HISTORY SPECIMENS.

Case No. 2—BEE LIFE.

A POLISHED Wood Case, with Hinged Glass Lid (12 in. by 9 in. by 3 in.), divided into Sixteen Compartments, and containing the **WHOLE LIFE HISTORY OF THE HONEY-BEE, from the Egg upwards**—24 specimens in all.

The Eggs, Larva, etc., are preserved in tubes, all capable of being handled; the Bees (queen, worker, and drone), Humble-Bee, Wasp, and Hornet are in transparent boxes. A full section of Honey-comb is in a separate and movable glass case.



Nos. 1 to 10, and 19 to 24, are in strong hermetically-sealed and toughened glass tubes; Nos. 11 to 16 in transparent boxes.

Every Object is properly named, and can be taken out of the Case and shown round the Class.

Price complete, 10/6 net
(PACKING CASE INCLUDED).

Descriptive Notes by ALFONZO GARDINER, fully describing every object, and forming Notes of Lessons for the Teacher, are given with each Case. The Contents are:—

1. Eggs.
2. Larva.
3. Cocoon.
4. Nymph or Pupa.
5. Imago.
6. Wax Scales.
7. Honey.
8. Pollen.
9. Propolis.
10. Ant.
11. Queen Bee.
12. Worker Bee.
13. Drone Bee.
14. Hornet.
15. Bumble Bee.
16. Wasp.
17. Empty Comb-work.
18. Queen Cell.
19. Sheet Wax.
20. Wax Foundation.
21. Natural Wax.
22. Bleached Wax.
23. Wasp Nest Paper.
24. Heather.

E. J. ARNOLD & SON, Ltd, LEEDS.

MURBY'S "CHARMING" SCHOOL CANTATAS, Etc.

"The best of children's Cantatas."—*Dispatch.*
"Very pretty."—*Referee.* "An ideal Cantata."—*Teachers' Aid.*
"The music is good, being tuneful and simple, without vulgarity."—*Athenæum.* "Charming though simple music."—*Daily Telegraph.*

"Eliza and the Imprisoned Fairy." Price 2s.
"Shakespeare's Merrie Meeting." Price 2s.
"Lost Dimplechin." Price 2s.
"Queen Hoveyou's Five o'clock Tea." 2s. 6d.
"The Hobby Horse; or, Work and Play." 1s.
"Up the Airy Mountain." Price 6d.

Diamond Drawing Books.
Cut and away the cheapest for quality we have ever seen.
THOMAS MURBY
3 Ludgate Circus Buildings, London, E.C.

"A capital series, cheap and good, and we heartily commend them to the notice of teachers."—*School Times.*

"Most attractive, while the quality renders them eminently useful."—*British and Colonial Printer and Stationer.*

"Supply a great want, and will tend to improve the taste and style of the pupils."—*Secondary Education.*

***** Send Stamps for Specimen Copies.**

"THE NEW FREEHAND."

Ask for Murby's Drawing Books.

16 Nos. 1d. to 8d. each.

"Considering the first-rate quality of paper, extremely low priced."—*Jour. of Education.*

"Splendid value for the money."—*Teachers' Review.*

MURBY'S ANALYSIS OF ENGLISH HISTORY.

1s. and 1s. 6d.

See New Edition for Important Additions and Improvements.

SKERTCHLY'S GEOLOGY. Ninth Edition. Revised to date. By JAMES MONCKMAN, D.Sc. Price 1s. 6d.
"In all respects an admirable introductory text-book to the subject in all its branches."—*Educational News.*

SKERTCHLY'S PHYSICAL GEOGRAPHY. Thirty-first Edition. Revised to date by J. H. HOWELL, B.A., Civil Service Department of King's College. 1s., cl.

DR. DICK'S HISTORICAL AND COMMERCIAL GEOGRAPHY FOR SCHOOLS. Embracing also Physical and Political Features. Revised to date. Price 1s. 6d.; with Maps, 2s.

MINERALOGY. Eleventh Edition, Enlarged. By F. RUTLEY, F.G.S., late of the School of Mines. 2s., cloth.

THE ARITHMETIC OF ELECTRICAL MEASUREMENTS. Seventh Edition. With Chapter on Electric Lighting Up-to-date, and numerous Examples fully worked. By W. R. P. HOBBS, R.N., A.I.E.E., Naval Torpedo School, Portsmouth. 1s.

CASTELL-EVANS' EXPERIMENTAL CHEMISTRY, including Qualitative and Quantitative Analysis. By JOHN CASTELL-EVANS, F.I.C., Technical College, Finsbury. Fourth Edition, price 2s. 6d. With Key, 6s.; Key alone, 3s.
"Far in advance, from an educational point of view, of anything that has appeared as yet in this country."—*Journal of Education.*

THOMAS MURBY, 3 Ludgate Circus Buildings, LONDON, E.C.

RECENT PUBLICATIONS.

New Editions thoroughly revised to date.

LARGE SCHOOL WALL MAPS
Of Africa, South Africa, and Pacific Ocean.

Size of each, 50 by 42 inches. Price, on cloth, rollers and varnished, 12s. each.

NEW OBJECT-LESSON PICTURES.
Round Fish, Flat Fish, Water-wheel, Windmill, Fishing Village, Cotton Plant, Rice Plant, Potato Plant, Wheat Plant, Candlemaker, and Pear Tree.

On cloth, rollers and varnished, 3s. 6d. each.

SEWING AND KNITTING DIAGRAMS.

Seven Sheets, Standards I.–VII. Price, on cloth, rollers and varnished, 3s. 6d. each, or 21s. for the Set, with Handbook.

ARTISTIC COLOUR AND BRUSH WORK.

For Higher Standards. By W. SCHOFIELD. Demonstration Sheets for Class Teaching. Set A—15 Sheets. Designs for Panels, with numerous suggestive Examples in Free Brushwork. (*A year's course.*) Set B—13 Sheets. Advanced Artistic Designs illustrating the Practical application of Brushwork. (*A year's course.*) Accompanied by a Handbook. The Two Sets in Envelope, price 5s.

W. & A. K. JOHNSTON'S

SERIES OF COOKING DIAGRAMS.

By HESTER DAVIES, Superintendent, Training School of Cookery, Cardiff.

Six Sheets, in Colours, size 34 by 28 inches. Price 3s. 6d. each; or 18s. for the Complete Set, on cloth, rollers and varnished.

Complete Catalogue of Wall Illustrations, Diagrams, Maps, Atlases, Terrestrial and Celestial Globes, post free to any address.

W. & A. K. JOHNSTON,
Edina Works, Easter Road, and 20 So. St. Andrew St., Edinburgh;
5 White Hart Street, Warwick Lane, London, E.C.

if he has passed the last, or last but one, Scholarship Examination prior to each admission.

The dearth of boy pupil teachers is undoubtedly answerable for the modified statement that girls may not, *as a rule*, become pupil teachers in a boys' school. Very little advantage will, we fear, be taken of this questionable privilege.

Pupil Teacher Grants.—In place of the variable grant, depending upon a fair or good pass, and upon the year of the candidate, it is recommended that "there shall be substituted a grant of forty shillings, to be paid annually for each pupil teacher recognised on the staff of the school at the end of the school year, and admitted on and after July 1, 1900. The number of grants paid for any pupil teacher shall not exceed the number of years for which he was originally admitted."

The Pupil Teacher and Drawing.—Geometrical Drawing is now defined as Geometrical Drawing (Art) of the Science and Art Department's Syllabus. There is to be but one class in freehand, and for a success therein fifteen shillings is in the future to be paid, except that this "future" is only to run for a brief period, for "no payment will be made on account of pupil teachers admitted on or after July 1, 1900."

Elementary Science.—A somewhat important change has been made in the syllabuses for this subject. In place of "*Energy*, which includes heat, radiation, electricity, and chemical action as forms of energy, and mechanical work," on and after October 1900 the following will be substituted for this paragraph:—"Pressure of liquids, Boyle's law, the barometer, siphon, common pump, and air pump." Why, nobody can say; but the Education Department is singularly inept in drawing up schemes for instruction in science.

Any Books.—Under Language Instruction a very sensible alteration has been made, whereby any books approved by the Inspector may be studied instead of those named in Schedule V. It will thus be possible for a pupil teacher to study for his pupil-teacher work the author set for his matriculation or other university examination.

Miscellaneous.—Amongst other changes, all of which we cannot of course refer to in this brief notice, may be mentioned Art. 12 (*c*), which prohibits the marking of registers for an afternoon meeting within an hour of the morning meeting; Art. 12 (*g*) (ii.), which permits attendance at central examinations to be marked; Art. 13, wherein the attendance of a scholar upwards of fourteen years of age, who has been under instruction *for more than one year* in Standard VII., is declared of none effect in calculating the average attendance; Art. 122, which states in a new footnote that science and art grants to training colleges will, after 1900, be paid upon the report of the inspectors, and not upon examination results, as at present; Art. 130 (*b*)—pensions—the number of which is now increased to 947 as compared with 876, the amount payable under this head (including donations) being £21,755, as against £20,155 for last year. After April 1, 1906, no application for a pension under this article can be received; and Schedule VII., III. (*e*) 8, which gives a qualified assent to the teaching of one, or even two, classes in a central hall.

For further minor changes we must refer our readers to the Code itself, which may be purchased from Messrs. Eyre and Spottiswoode for 5½d.

With respect to the Instructions, these are not, at the time of going to press, to hand, but we are assured that they will be couched in the same spirit which is so pleasantly evident in the pages of the admirable Code, which, we are convinced, practical teachers will hail with considerable satisfaction.

THE SCOTTISH EDUCATION BILL.

THE introduction of the Scottish Education Bill by Lord Balfour of Burleigh on March 16 forms a very important landmark in the progress of Scottish education, and, if carried, will remould to a large extent the higher education given in Scottish schools. So far reaching are its effects, so numerous are the local interests it involves, so great are the risks of petty jealousies it may arouse, that Lord Balfour proposes to postpone the second-reading stage for a considerable time, in order that full opportunity may be given for the consideration of the measure in Scotland.

Purpose of the Bill. The main purpose of the Bill is to amend and extend the provisions of the law of Scotland on the subject of education. It is chiefly concerned with higher education, and its object is to organise in one system the administration of the various funds which are now devoted to the purposes of higher education in its various branches, and also to appoint local representative bodies, and give them statutory power over the management of higher education. The necessity for such a Bill does not show that there has been any remissness in the past in the matter of secondary education, or that the state of our system of higher education in Scotland is in the complete chaos and confusion which it pleases some people to indicate to be the case. The chief weakness of the present system is to be found on the financial side.

The New Code. Lord Balfour claims that the reconstitution of the Code has met with a very cordial welcome throughout the country, and that the establishment of the Merit Certificate has at any rate fairly satisfactorily solved the problem of the line of demarcation between elementary and secondary education. The development of the Evening Continuation Schools, and the unification of the Scotch Education Department with that of the Science and Art Department, have attained a fair measure of success.

A Higher Education Fund. The Bill proposes to amalgamate the funds of the Local Tax Fund of 1890, amounting to between £50,000 and £60,000, the sum devoted to Secondary Education under the Act of 1892, amounting to £60,000, and the sum of £35,000 set apart by the Act of 1898—in all £150,000 a year—and to put these into a Higher Education (Scotland) Fund. He recognises, in connection with the remaining £100,000 set apart under the Act of 1892, that it will be better to leave it alone, because at present it is not exclusively applied to education, and because there are very many useful objects to which part of it, at any rate, is distributed. It is true, as he points out, that every district cannot have a higher school, but he hopes that the authority proposed to be set up will rule over a wider area than the parish or burgh, and will be enabled to harmonise existing arrangements, and to provide that every child, either by means of higher schools, or higher departments, or, in the event of these two methods failing, by means of bursaries, will be brought within the reach of the higher school, where he or she may be capable of profiting by it.

Higher Education Committees. The Bill proposes to take as the unit of administration the county and some of the large burghs, and one parish, that of Govan. It has not been found possible, Lord Balfour says, to lay down in any clause of the Bill the precise conditions of the constitution of these Higher Education Committees. It is proposed to do it by a scheme to be subsequently approved by Parliament. The intention is that there shall be on these committees a considerable representation of the municipal element, whether County Council or Town Council; that those School Boards which give higher education shall also be represented; and that there shall be a small admixture of gentlemen chosen for their interest in education, and on account of their possessing the confidence of the locality. These committees are to have a permanent statutory position, to be independent of the Department to a much greater extent than at present, and to have statutory powers for regulating higher education within their various bounds. He does not propose to break altogether with the principle of purely local management for the schools—in other words, to take the burgh schools from the School Board, and limit the operation of these Boards only to elementary education.

The new bodies are to have large powers of supervision and of regulation, and the complete power of control given by the financial provisions of the Bill. They are to have the power to admit and exclude all schools, both higher schools and higher departments, from the benefits of the Act. They will have ample opportunity of expressing their opinion upon the curriculum of the various schools, although in that matter there will be an appeal to the Department. They will have powers to employ teachers, where necessary, in the schools under local management, and they may be represented on the management of the large central institutions for advanced scientific and technical education.

Grants. The grants will in future be distributed on well-defined principles. The first charge on the fund will be the cost of inspection, calculated at about £8,000. The second charge on the fund is to be about £3 a head for the pupils in attendance in the higher schools; this will absorb about £33,000. The balance of £110,000 will remain for all the other purposes of the localities, as decided by the county committees.

Attendance and the Age Limit. The Bill, though primarily intended to deal with higher education, also includes one or two other points. The attendance of children at elementary schools is referred to in one clause. The evils of what are known as standard exemptions—that is, exemption on attaining a certain standard, perhaps at a very young age—have, Lord Balfour says, been present to the minds of many educational authorities in Scotland for many years. He proposes, therefore, the raising of the age to fourteen; but in the

Bridge's Patent

MOVABLE PARTITION FOR SCHOOLS

Is Elegant in Design,
Simple in its Action, and
Remarkably Easy to Manipulate.

It can be fitted to any size or shape of room, and a single person can open or close a 25 ft. or 30 ft. Partition in less than one minute. Designs and estimates free on application.

Bridge's Patent

SCHOOL DESKS,

The "Incomparable,"
The "Kidderminster," and
The "Invicta,"

Have been supplied to a large number of schools, and have received the highest praise from H.M. Inspectors and Teachers. Illustrated Catalogue sent free on application.

Specimens of the above Desks, and a Model of the New Movable Partition, will be shown at the Publishers' Exhibition, N.U.T. Conference, York.

The Stourbridge Educational Co., Ltd.,
LYE, STOURBRIDGE.

THE

WILLIAMS TYPEWRITER.

The only Machine combining strictly visible writing and direct inking. Prints like a press.

Thousands are now in use, and the WILLIAMS is the favourite when compared with other writing machines.

Write for Catalogue and samples of work.

WILLIAMS TYPEWRITER CO. for Europe,
Newgate Street, LONDON.

Cusack's Publications

CUSACK'S SET OF TEN DRAWING MODELS
(Including Two Vase Forms).

Perfect in shape, strongly made in wood, and painted. In two sizes; large and small. The large is the size for Schools of Art and Art Classes; the size prescribed by the Science and Art Department for the May Exams. The small size (cube 6¼ in., and other models in proportion) is for Students' Private Study.

Prices—Large Size, 40s. net; Small Size, 20s. net.
Carriage Paid. Packing Case and Packing Free.

CUSACK'S SET OF FOUR DRAWING MODELS
(Sphere, Small Cube, Skeleton Cube, Vase).
In Wood, as required by the Science and Art Department.
Exact Size as Prescribed.
Price 16s. net. Carriage Paid. Packing Case and Packing Free.

Casts For Shading.

CUSACK'S SET OF SIX ELEMENTARY ROSETTE FORMS
(In Wood) afford the best possible practice for beginners in Shading.
In 1898 the Examination in Elementary Shading was based on a rosette.
Price 10s. 6d. net. Carriage Paid. Packing Case and Packing Free.
Photographs of the Sets can be had post free on application.

CUSACK'S LEAD PENCIL COPY BOOKS
For Infant Schools.
Price 8d. per dozen net. Complete Series in Four Books.

The objections to Slates and Slate Pencils are many:—
1. It is impossible to hold the slate pencil as the pen *should be held* in writing; hence infants contract bad habits difficult to eradicate afterwards.
2. The noise of the pencil on the slate is unpleasant, and irritating to many.
3. As the copies are all rubbed out, there can be no permanent record of the child's work or progress.
4. The means adopted in many cases for cleaning the slate is an effective cause of the spread of infectious diseases among children.

These and many other objections are at once obviated by the use of Paper and Lead Pencil.

In the above series of Copy Books, besides the headlines being given in a bold style, the whole page is outlined with the given copy.

The very low price quoted—**only Eightpence per Doz. (8d.)**—should bring them within the reach of all Schools.

Specimen Set (free) will be sent to the Head-Teacher of any Infant School.

CUSACK'S JOURNAL, 1d. A Monthly Paper for Teachers.
For Instruction, Improvement, Amusement, and General News.
Pupil Teachers, Acting Teachers, and all Teachers.

CITY OF LONDON BOOK DEPOT, White St., Moorfields, London, E.C.

MARLBOROUGH'S

"SELF-TAUGHT" SERIES
Of Foreign Languages.

Giving the English Phonetic Pronunciation of all Words and Phrases. Containing Vocabularies, Elementary Grammar, Conversations, etc.

	Wrap., Cl.		Wrap., Cl.
FRENCH SELF-TAUGHT. "This book will be found deserving a trial."—*Educational News.*	1/-, 1/6.	**ITALIAN SELF-TAUGHT.** "As used in the LONDON Board Schools' Evening Classes."	1/-, 1/6.
GERMAN SELF-TAUGHT. "This is a practical little book."—*Schoolmaster.*	1/-, 1/6.	**SPANISH SELF-TAUGHT.** "It is one of an excellent and desirable series."—*Practical Teacher.*	1/-, 1/6.

Catalogue of Works for the study of Languages gratis on application, mentioning this publication.

E. MARLBOROUGH & CO., 51 Old Bailey, LONDON, E.C.

CODE BOOK-KEEPING, etc.

SARLL'S BOOK-KEEPING FOR NEW CODE. Stage I. Introductory; II. Practical; III. Theory or Journalizing. Each 48 pp. Price 4d. Outline Keys. MS. Books, 2d. each. *Schoolmaster* says:—"They are the *best and cheapest* manuals of the kind in the market."

SARLL'S PRACTICAL BOOK-KEEPING. Fourteenth and *greatly* improved Edition. *Teachers' Aid* says:—"There is no *cheaper* and *safer* guide." Consists of Grad. Exercises and Exam. Papers, with *full* or *outline* Keys. 128 pp. 1s. MS. Books, superior, 1s. Cheap, 4d.

SARLL'S DOUBLE-ENTRY BOOK-KEEPING. Thirteenth Edition. 2s. Complete with *full* or *outline* Keys. *Practical Teacher* says:—"We *heartily* recommend it as the *best* and *cheapest* manual we have seen." For Soc. of Arts Exams., Civil Service, &c. 256 pp. MS. Books, 1s. Cheap, 4d.

SARLL AND SOC. OF ARTS—NEARLY 1,300 CERTIFICATES and Two Bronze Medals. Results unsurpassed by any teacher in Great Britain.

SUPPLEMENTARY KEYS. Now Ready.

I. TO SARLL'S PRACTICAL. Containing FULLY-WORKED Keys to *all* the Exam. Papers in Practical at 1s., and to *all* the Exercises in Stages I. and II. at 4d. Two Shillings.

II. TO SARLL'S DOUBLE-ENTRY. Containing FULLY-WORKED Keys to *all* the Exam. Papers in "D Entry" at 2s., and to *all* the Exercises in Stage III. at 4d. Three Shillings.

*** **Specimen Copies—except Keys—at one-third off, or Teachers can have Parcels for inspection, Post Free, from A. SARLL, A.K.C. (Lecturer, People's Palace, E., Polytechnic, W., &c.), 62 Oakley Road, London, N.**

Twenty Lessons by Correspondence for 10s. 6d.

London: GEORGE GILL & SONS, 13 Warwick Lane, E.C.

cases where this age is thought too severe, the School Board may exempt any child after twelve, if he consents to go to an evening continuation school.

Teachers' Tenure. Another matter dealt with in the Bill is the subject of much controversy—teachers' tenure. After stating that he had received a deputation on this subject, and had not been convinced by the statement of specific cases, he says he is not in a position to see his way to interfere with the powers of School Boards in this matter, or to set up a court of appeal. He has, however, inserted a clause which empowers the Department, where they think it right, to grant a certificate to a teacher who has been dismissed, to the effect that in spite of his dismissal his work has been satisfactory. He thinks there are cases in which, perhaps from misunderstanding or a want of tact on one side or the other, or from casual circumstances, creating on both sides a bad feeling, it is not for the interests of education in the parish that even an efficient teacher, and more or less blameless, should continue in the school. The object of inserting the clause is solely to secure that a man who has lost his employment, probably through no very grave fault of his own, should not have his professional position destroyed, but should be helped by means of this certificate to secure further employment.

THE REFORM OF SECONDARY EDUCATION IN FRANCE.*

THE educational world is at present suffering from a general spirit of unrest. This is especially true of secondary education. In Germany matters came to a head in 1890, when the Emperor carried out a series of two-edged reforms, directed, on the one hand, against the ultra-classicists, and, on the other, against progressive and socialistic ideas. The notion was to shift the centre of instruction from the teaching of Latin and Greek to that of the mother tongue, while modern German history was to be used as an engine for developing the proper national spirit—that is to say, it was to be doctored in such a fashion as to serve as a support to the altar and the throne. The effort has not, however, been a complete success. We, too, have also had our Commission on Secondary Education, followed by the modest effort in legislation which is known as the Board of Education Act. Even this instalment of reform, scanty as it is, seems likely to have its dimensions further reduced by the Departmental committee at present considering the application of the Act. In France, a Commission, presided over by M. Ribot, has just formulated its recommendations for the reform of secondary education. The task was certainly no easy one, many of the questions being in what may be called the acute state. First of all, there is the competition of the Catholic with the State schools, which has resulted in the partial destruction of the *écoles laïques*, and now threatens the supremacy of the *lycées* and *collèges*. Inside the State schools themselves the defects are numerous. The classicists are not only at loggerheads with the advocates of modern education, but also with one another. The establishment of higher-grade schools has not entirely solved the secondary problem. It is evident that what is greatly wanted in France to-day is the establishment in the *collèges* of a lower secondary education, to terminate at sixteen, and serve as a preparation for commercial and industrial life. Perhaps the greatest plague of all is the uniformity that the all-powerful administration has imposed on all schools, regardless of the needs of the localities. Our own primary schools could probably retail similar experiences. What is wanted is more elasticity and more variety, but that is difficult to introduce in a highly-centralised country like France, in which local authorities have no real independent standing. The expense of setting up a regular State school, with all the paraphernalia of officials, is often prohibitive in smaller districts. The Commission advise the licensing and subsidising of efficient private schools in such neighbourhoods. As for the Catholic schools, they do not propose to suppress them, but to place them under inspection. This is only right and proper; the State is perfectly justified in seeing that the education given should not be a sham, but a real thing. To compete with the underbidding which exists on the part of the *écoles libres*, it is proposed that the State should give up the notion of deriving any profit from the *internat*, and hand over the whole licensed victualling business to the administrative officials. The authority of the head-master, who is often a mere lay figure, is to be increased. At present his hands are so tied he cannot order "two penn'orth of twine" without consulting the central authority. Until recently he was peculiarly liable for all accidents to life and limb which occurred to pupils on the premises, even when the accident was the result of the purest inadvertence, as, for instance, if a pupil tripped in walking across the court and broke his leg.

One of the most intricate questions the Commission have had to deal with is the status and function of the *répétiteur* who corresponds to the English usher of bygone days, and is possibly the descendant of the "pedagogue" whose duty it was to conduct children to school. He has nothing to do with the teaching of the pupil; he is a mere representative of law and order out of school and in preparation; and the exact amount of respect he inspires in those under his charge is accurately gauged by his nickname of the spy (*pion*). The professors, also, look down on him as an inferior person, although nowadays he is often a *licencié*, and even an *agrégé*. We have thus the very queer state of things that the educational side, which is really the more important, is under a mere hireling like the *répétiteur*; for the ordinary professor considers his duties are limited to giving instruction. He can, indeed, do but little more if he will. In many cases he sees his class but three or four times a week. The French professor is, in his way, a most conscientious person; it is only the abominable system that is to blame. The Commission have made a move in the right direction in proposing that the *professorat* should be thrown open to the *pion*, and the more disagreeable *corvées* of dormitory and other work are to be relegated to inferior *répétiteurs* who need not be on the staff at all.

Other important reforms are the abolition of the *baccalauréat*, and the obligatory training of secondary teachers. The latter is most important. The *école normale*, as it stands to-day, is merely an intellectual "forcing-house." It makes little or no pretence of instructing its students in the science and art of teaching. It is noteworthy that while gymnastics are mentioned with approval, the whole question of *les jeux en plein air* is summarily dismissed with an ironical remark on the folly of trying to metamorphose young Frenchmen into Englishmen. We hope, all the same, that the three innovators, Demolins, Duhamel, and le Père Didon, will convince their countrymen of the educational value of outdoor games. There is nothing like them for breaking down the party walls that exist between masters and boys, and making them feel they are members of one body. The Jesuits made the schools into jails, and Napoleon tried to turn them into barracks; and such they are likely to remain till perhaps a new Rousseau will arise, whose Emile will show the people that what is most to blame is their arbitrary system of education, which subjects to the same discipline the boy of nine and the youth of seventeen. A study of English method would convince them that the successful education of the will is not necessarily the result of strict control or surveillance. Otherwise our criminals would be the *fine fleur* of our education. It is rather brought about by a wise and gradual relaxation of discipline, which, as it increases the liberty of the pupil, imposes on him a corresponding amount of responsibility.

* *La Réforme de l'Enseignement Secondaire. Par M. Ribot, Député, Président de la Commission de l'Enseignement.* (Armand Colin and Co., Paris.)

ALLMAN AND SON.

Euclid: Books I. and II. By Telford Varley. The editor of this book has attempted, with considerable success, to remove some of the unnecessary difficulties which confront the beginner, without in any way detracting from the value of the subject as an exercise in logical reasoning. The alternate proofs—for example, that to Prop. 5—are clever, and the explanations and arrangement throughout are all that could be desired. We wish the book the success which it deserves.

Questions on "As You Like It." By John Lees. It would probably be difficult to set a question on this play which Mr. Lees has not in some way anticipated. Certainly any student who could answer all the questions here given knows all there is worth knowing about it. The book is interleaved, which facilitates the making of notes.

A. AND C. BLACK.

The Age of Hawke. By L. W. Lyde. "Lest we forget" is the motto of this set of readers, and sufficiently explains the object of their issue. The number before us contains a well-edited life of Hawke, and is just the kind of book which all British boys should read.

A Geography of the British Empire. By L. W. Lyde. We have had an opportunity, in reviewing other numbers of the series, to comment on Mr. Lyde's ideas and plan in writing a text-book in geography. The present volume is as readable and interesting as its predecessors, and contains most of the information concerning the colonies which is really useful.

Oxford University Press.

OXFORD CLASSICAL TEXTS.

Already Published:—

THUCYDIDIS HISTORIAE, TOM. I. (Libri I.–IV.). H. STUART JONES. Paper covers, 3s.; limp cloth, 3s. 6d.

PLATONIS OPERA, TOM. I. (Tetralogiae I.–II.). J. BURNET. Paper covers, 5s.; limp cloth, 6s.; on India Paper, 7s.

LUCRETI CARI DE RERUM NATURA. C. BAILEY. Paper covers, 2s. 6d.; limp cloth, 3s.; on India Paper, 4s.

CORNELII TACITI OPERA MINORA. H. FURNEAUX. Paper covers, 1s. 6d.; limp cloth, 2s.

Full List of the Series supplied on application.

Just Published. The Library Edition.

Demy 8vo, pp. xvi.-354. With Two Collotypes of Handwriting and Nine Facsimile Title Pages. 7s. 6d.

THE POETICAL WORKS OF JOHN MILTON. Edited, after the Original Texts, by the Rev. H. C. BEECHING, M.A., Balliol College, Oxford; Clark Lecturer at Trinity College, Cambridge.

Also issued, with Portrait and Facsimiles, by the same Editor, the following sizes:—

1. LARGE (Longprimer) TYPE, crown 8vo, 565 pages, cloth boards, gilt top, 3s. 6d.
2. THE SAME, printed on Oxford India Paper, superfine cloth, gilt top, 6s.

(In these Editions the original Spelling and Punctuation are reproduced.)

Mr. Henry Frowde also publishes a MINIATURE EDITION complete in One Vol., printed on Oxford India Paper, 32mo, 4¾ by 2¾ inches, with Modern Spelling and Punctuation, superfine cloth, 3s. 6d.

*** These volumes may be had in a variety of superior leather bindings produced at the Oxford University Press Binding House.

LATIN EDUCATIONAL WORKS.

By JOHN BARROW ALLEN, M.A.

RUDIMENTA LATINA. Comprising Accidence, and Exercises of a very Elementary Character, for the Use of Beginners. Extra fcap. 8vo, 2s.

AN ELEMENTARY LATIN GRAMMAR. *New and Enlarged Edition.* Extra fcap. 8vo, 2s. 6d.

A FIRST LATIN EXERCISE BOOK. *Eighth Edition.* Extra fcap. 8vo, 2s. 6d.

A SECOND LATIN EXERCISE BOOK. *Second Edition.* Extra fcap. 8vo, 3s. 6d.

*** A Key to First and Second Latin Exercise Books, in one volume, price 5s. *net*. Supplied *to Teachers only*, on application to the Secretary, Clarendon Press.

LIVES FROM CORNELIUS NEPOS. Miltiades, Themistocles, Pausanias. With Notes, Maps, Vocabularies, and English Exercises. Extra fcap. 8vo, 1s. 6d.

TALES OF EARLY ROME. Adapted from the Text of Livy. With Notes, Maps, Vocabularies, and English Exercises. Extra fcap. 8vo, stiff covers, 1s. 6d.

London: HENRY FROWDE, Oxford University Press Warehouse, Amen Corner, E.C.

HARTLEY COLLEGE, SOUTHAMPTON.

DAY TRAINING COLLEGE FOR MEN AND WOMEN.

PRINCIPAL:

R. WALLACE STEWART, D.Sc. (Lond.).

SPECIAL NORMAL STAFF:

Normal Master..... C. R. CHAPPLE, B.A. (Lond.).

Assistant Teachers... HORACE E. PIGGOTT, B.A. (Lond. and Wales).
Miss AUBREY.
W. JACKSON.
Miss H. O. BUTLER.

Lady Superintendent of Hostel for Women Students: Miss EVA BLAXLEY, B.A. (Lond.).

COLLEGE LECTURERS:

Education..... C. R. CHAPPLE, B.A. (Lond.). HORACE E. PIGGOTT, B.A. (Lond. and Wales).

Classics and English.. W. F. MASOM, M.A. (Lond.), B.A. (Camb.), University Exhibitioner, late Scholar of St. John's College, Cambridge.

English and History.. Miss EVA BLAXLEY, B.A. (Lond.), University Exhibitioner in English.

French and German.. E. DU BOIS, B. ès L., M.A., Ph.D.

Mathematics..... C. E. CULLIS, M.A., Ph.D., Fellow of Gonville and Caius College, Cambridge.

Physics..... The PRINCIPAL. J. LUSTGARTEN, B.Sc. (Vict.).

Chemistry..... D. R. BOYD, B.Sc., Ph.D. (late Examiner in Chemistry, Glasgow University).

Biology and Geology.. E. T. MELLOR, B.Sc. (Lond.).

Engineering..... J. EUSTICE, A.R.S.M., Assoc. Mem. Inst. C.E.

Art..... H. SCHRODER, A.R.C.A. E. CROMPTON, Gold Medallist. Miss E. I. CONWAY (late National Art Scholar).

Students are prepared for graduation in Arts or Science at London University, in addition to their professional training.

Instruction is provided for Men Students in Manual Training (Woodwork and Metal-work).

Six Scholarships, three of £10 each and three of £5 each, are awarded on the results of the College Entrance Examination.

Copies of the Prospectus of the Day Training Department, giving full particulars, may be obtained on application to the Clerk.

Applications for admission are invited, and should be made to

D. KIDDLE, *Clerk.*

TEACHERS' DIPLOMAS

(A.C.P., L.C.P., and F.C.P.).

N.B.—These Diplomas fully satisfy the requirements of the Teachers' Registration Bill, which will probably become law at an early date, and which states that no one shall be admitted to the Register unless he possess some *Diploma* in "Theory and Practice of Education." They are the only Diplomas in that subject which entitle the holders to wear Academical costume—cap, gown, and hood—and which confer a *title*.

Striking Success of

DIPLOMA CORRESPONDENCE COLLEGE

At the A.C.P. Examination, January, 1900.

Of the **263** Candidates who entered, **64** obtained the Diploma;
Of the **39 D.C.C. Students who sat, 37 obtained the Diploma.**

Being **58** per cent. of the **entire Pass List,** and bringing our list of Successes to

165.

Short Course for July, 1900.
Ordinary Course for January, 1901.

Send stamp for full Particulars, Prospectus, Terms, List of Successes, and Testimonials, to

J. W. KNIPE, Esq., Ph.D., L.C.P., F.R.S.L., Principal,
DIP. CORR. COLL., FISHPONDS, BRISTOL.

"AN ADDED ZEST

to Elementary Education."

"A Boon to Practical Teachers"—"Quite Admirable"—"A Delightful Material"—"Capable of being used to illustrate almost Every Branch of Instruction"—"The more I know of it the more I like it."

Such are some of the expressions of opinion of leading authorities in education on the merits of

Have you tried it in your school? If not, send for a specimen box of assorted colours, tool and illustrated instructions, and let **Plasticine** speak for itself. Invaluable for Relief Maps.

Price **1/3,** post free, from all School Furnishers, or from

WM. HARBUTT (Dept. P.C.), BATH.

BLACKIE AND SON, LONDON.

The Agricola of Tacitus. Edited by W. C. Flamstead Walters, M.A. This is a short scholarly edition of the *Agricola* for the use of private students and higher forms in schools. The basis of the text is that of Halm, but references are given to other editions—for example, that of Furneaux. A good introduction gives an account of the life and works of Tacitus, an estimate of Tacitus as a historian, a summary of Agricola's life, and a summary of Romano-British history. The illustrations are very interesting, illustrating, as they do, the life and work of Agricola in Britain. They include a map of Roman Britain, the Roman bath at Bath, the Roman gateway at Pevensey, a plan of Silchester (the ancient Calleva), etc. A very useful feature of the book is the critical appendix, containing a note on palæography, the MSS. of the *Agricola*, and the chief various readings. The notes are chiefly biographical, with brief hints on translation. An appendix discusses questions connected with the *Agricola* and the purpose of the *Agricola*. For the use of the private student Mr. Walters gives a number of hints on translation, and he has adapted fifteen English-Latin exercises to chapters of the *Agricola*. After a complete vocabulary there are a historical index and an index of noticeable matters of grammar and style, which, from their position, are likely at first to be overlooked.

WILLIAM BLACKWOOD AND SON.

From Capetown to Ladysmith. Those of our readers who possess copies of *Egypt in 1898*, and *With Kitchener to Khartum*, will be glad of the opportunity afforded by the issue of this "unfinished record of the South African War," of obtaining the last collection of letters written from the front by the late G. W. Steevens. As all the world knows, the career of this brilliant young journalist and scholar was cut short by death from enteric fever whilst suffering with his fellow-men during the long siege at Ladysmith. The book contains fifteen chapters relating to the campaign. The chapter on the "Battle of Elandslaagte" is a striking example of the author's extraordinary gift for recording his impressions, and this chapter alone makes us keenly realise what an able and descriptive writer the world has lost. The last chapter, consisting of some forty pages, is an admirable character sketch by the editor, Mr. Vernon Blackburn. Bound in khaki, and containing an excellent map in colour of the seat of war, this book is well worth a place in any private or public library.

W. AND R. CHAMBERS.

New Recitations for Schools. Selected and arranged by R. C. H. Morison. The five books under notice contain for the most part poems which, though not usually found in such selections, are very well suited for children. We confidently recommend them to our readers.

CHARLES AND DIBLE.

Winsome Words. Being Recitations for the Little Ones. By Ellen Terrey. This is a very nice collection of recitations for the "little ones," of much higher level than many of the so-called poems taught in schools. We advise our readers to get it.

The "Compromise" Series of Outline Maps. This series of maps is intended to be a "compromise" between the memory map and the reference map, possessing "the simplicity of the former and the accuracy of the latter, yet avoiding the crudeness of the one and the intricacy of the other." They are certainly very neat in appearance, and bear on the back a useful summary of the geography of the district represented. They are among the best maps of the kind we have seen.

W. B. CLIVE, LONDON.

Æschylus: Prometheus Vinctus. Edited by F. G. Plaistowe, M.A., and T. R. Mills, M.A. This volume of the "University Tutorial Series" is clearly printed and carefully edited. The introduction treats briefly of the origin of Greek tragedy, the production of a Greek drama, the Dionysiac theatre, the structure of a Greek tragedy—its metre and dialogue. There is a short life of Æschylus and a brief mention of his writings. The characters and scene of the play, its story, its place as the first play of a trilogy, the import of the play, the earliest form of the myth in Hesiod, the date of the play, and its divisions are also briefly discussed. The notes are useful and clear, especially those on points of grammar. The lexicon is not superseded by a vocabulary.

Isocrates: De Bigis. Edited by W. J. Woodhouse, M.A. This edition is intended chiefly for candidates at the Lit. Examination (1901) at the Cape of Good Hope University. It is the only edition with English notes that has yet appeared. An interesting account is given of the life and works of Isocrates, especially the *De Bigis*, and of Alcibiades and his times. There is an analysis of the Oration. The notes are mainly historical and grammatical.

The Matriculation History of England. By C. S. Fearenside, M.A. Teachers who have to prepare forms for the London Matriculation have long been waiting for the appearance of a text-book adapted to the special requirements of their students. Mr. Fearenside has attempted, with some success, to meet this want. So far as method and information are concerned, indeed, his History is all that can be desired, though the arrangement in short paragraphs, with heavy-typed headings, inevitably suggests "cram," however unjustly to the author. It is surely, however, an error of judgment to exclude all notice of literature, and to confine the treatment of the social history of the people to a few incidental paragraphs. A still graver mistake is the introduction of occasional words and phrases which detract seriously from the style of the work—for example, "grown-ups" (p. 19, note); "thrashed" (p. 98); "a cheaper home-made article" (p. 193); "conspectus" (p. 258), etc. The maps are too small for the number of names they contain, and are badly printed, so that they present a very confused and confusing appearance at first sight. On the other hand, the occasional summaries are excellently conceived and written, the genealogical and other tables clear and well arranged, and the sequence of events plainly disclosed. In dealing with the earlier Stuart period, the prominent part played by individual men—notably by Buckingham, Strafford, and Pym—is somewhat obscured by the method of treatment selected by the author. But it would be impossible for a careful student to read the work as a whole without finding himself fully prepared for the examination aimed at.

A Primer of French Verse, for Upper Forms. Edited by Frederic Spencer, M.A., Ph.D., Professor of the French Language and Literature at the University College of North Wales. This is an excellent work, supplying a distinct need. French poetry has been unduly depreciated, but the schoolboy who goes through Professor Spencer's book will not only learn to appreciate the rhythm and harmony of French verse, but will make acquaintance with some of the most beautiful efforts of the French muse. The editor has wisely refrained from prefixing any general essay on French prosody to his work. The principles of syllabic measurement are first clearly explained and illustrated by a number of choice examples. Other points are taken up and illustrated in the same way, after which the various forms of French verse come in for similar treatment. The advantages of theory and practice going thus hand in hand are too obvious to need pointing out. Well-chosen extracts from Racine, Corneille, Molière, Chénier, Alfred de Vigny, and Victor Hugo occupy the second half of the book. Professor Spencer's work will afford both profit and delight to those who study it.

HACHETTE AND CO.

Minna von Barnhelm. Edited, with introduction, grammatical and explanatory notes, and a full vocabulary, by J. F. Davis, D.Lit., M.A. (Lond.), Assistant Examiner in the University of London. Dr. Davis has spared no pains in the production of a really good school edition of Lessing's comedy.

German Prose Composition. By A. L. Meissner, M.A., Ph.D., D.Lit., Librarian and Professor of Modern Languages in Queen's College, Belfast. This work is prefaced by a very interesting introduction dealing with the influences which have moulded German prose style, and with the main differences between the syntax of English and German. A series of carefully-graded introductory exercises is followed by passages selected from English authors for translation into German. These are well graduated, as regards both difficulty of style and the amount of assistance given in notes, and a very complete vocabulary is appended. Professor Meissner's book is one we have pleasure in heartily recommending to our readers.

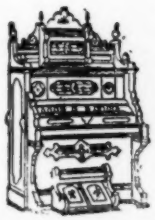
Leading Events of Modern Warfare. Advanced German readings, selected from standard authors, and edited, with a complete German-English vocabulary, by Aloys Weiss, Ph.D., Professor of German at the Royal Military Academy, Woolwich. Mr. Weiss's book will be found very useful by military candidates. The extracts are interesting, and deal with the great land and sea battles of the present century, from Trafalgar to the capture of Wei-hai-wei by the Japanese. The vocabulary and notes are good. Students for service examinations who are taking German will be able by the study of this book to improve their acquaintance with German, and acquire at the same time the German equivalents for military and naval terms.

BRITISH MUSEUM 29 MAR 1900

THE

EDUCATIONAL MUSICAL INSTRUMENT CO.

ESTABLISHED 1881.



For Circular, Testimonials, and ANY Maker's List and designs, apply to the

MANAGER,

43,

Estate Buildings, Huddersfield,

21 Argyle Crescent, Portobello, EDINBURGH; or at 20 Highbury Place, LONDON, N. (*Close to Highbury Station and Trams.*)

PIANOS, &c., FOR SCHOOL AND HOME USE.

We are offering a range of instruments **specially made** for School work, at prices within the reach of all. We have supplied some **eleven hundred** for this purpose, and can please you fully, and **save you much money.**

In Pianos and American Organs for Home use our lists indicate the best bargains in the market at the prices quoted, cash or instalments, and **many thousands of Teachers School Managers, etc.,** have testified to the unequalled advantages we offer.

* See our 45 Guinea Piano for £21 Cash, or 36 payments of 14/- per month.

We pay carriage, give a month's free trial, a ten years' warranty, and **exchange free o cost** if the instrument sent is not all that is desired.

N.B.—All our Pianos are fitted with a special action to the Soft Pedal that **fully subdues the tone,** and **effectually preserves** the instruments during practice.

Mr. JOHN HOOPER, Clerk to the School Board, Hanley, Staffordshire, writes:—"I am instructed to order from you five more Pianos on the terms mentioned in your letter. (We have supplied thirteen Pianos to the Schools under this Board.)

Mr. J. H. YOXALL, M.P., Gen. Sec., N.U.T., writes:—"I enclose cheque in payment for Piano; the choice reflects the greatest credit on your firm. I am entirely satisfied with it in all respects, and I feel sure that a customer benefits very much by taking advantage of your experience and large connection."

Show Rooms open Daily. Call and see our Stock, or write for our List of Instruments for Home or School Use, specifying the class preferred, and you will find

WE CAN SAVE YOU MANY POUNDS.

(*Please mention this Paper.*)

THE MOST NUTRITIOUS.

EPPS'S

GRATEFUL—COMFORTING.

COCOA

BREAKFAST—SUPPER.

BORD'S PIANOS.

FOR SALE, with 25 per cent. Discount for Cash, or 14s. 6d. per month (second-hand, 10s. 6d. per month) on the Three Years' Hire System. Lists free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.—Pianos exchanged.

BECHSTEIN PIANOS.

These magnificent Pianos for hire on the Three Years' System, at advantageous prices and terms. Lists and particulars free of CHAS. STILES & Co., 40 and 42 Southampton Row, Holborn, London, W.C.

. . The . .

"COMPROMISE"

SERIES OF

OUTLINE MAPS.

By OWEN A. PARRACK.

These Maps are essentially a compromise between the **MEMORY MAP** and the **REFERENCE MAP,** possessing the **simplicity** of the former and the **accuracy** of the latter, yet avoiding the crudeness of the one and the intricacy of the other.

The Maps are printed on **Cardboard,** in **Two Colours.** On the back of each Map, **Geographical Outlines,** together with **Instructions for Drawing and Colouring,** are printed.

The following Maps are now ready:—

LONDON. WEST HAM. SURREY. SUSSEX. ESSEX. KENT.

Price, per dozen, 6d.

WINSOME WORDS. Being Recitations for the Little Ones. By ELLEN TERREY. Price, net, 6d.

CHARLES & DIBLE,

Kindergarten and Educational Publishers.

LONDON— 10 Paternoster Sq., E.C. | GLASGOW— 155 St. Vincent Street.

INK. ***"Duckett's Dry Inks" (Cold-water Ink-powders) produce Ink at less than a quarter of the cost of equal quality Fluid Ink, and with less trouble. Though thousands of schools have adopted them, other thousands have not yet given them a trial. That is a great pity, seeing we offer samples gratis and post free to teachers, representative men, etc., all the world over. Address always:—***

DUCKETT'S DRY INKS, SHEFFIELD.

NEW EDITION. *56th YEAR OF PUBLICATION.*

Reduced Fac-Simile of Cover.

Wightman's Arithmetical Table Book.

Embraces the principal Tables that should necessarily be acquired by the student in all grades. A most compact and useful book.

Crown 16mo, 64 pages.

PRICE ONE PENNY.

Many Million copies of this valuable work have been sold.

MAY BE HAD OF

SIMPKIN, MARSHALL, HAMILTON, KENT & CO., LTD.,

Stationers' Hall Court and Paternoster Row;

OF THE PRINCIPAL SCHOLASTIC AGENCIES,

AND OF THE PUBLISHERS,

WIGHTMAN & CO., Ltd., Old Westminster Press, Regency St., LONDON, S.W.

W. AND A. K. JOHNSTON.

Cooking Diagrams. By Hester Davies, Superintendent of the Cardiff School of Cookery. This series of six diagrams, illustrating the various joints of meat, the parts of the animal they come from, the vegetables commonly used, different kinds of fish, etc., should be found in every cookery centre. They are well drawn and coloured, varnished, and mounted on rollers. The whole series is excellent.

E. L. KELLOGG AND CO.

Lessons on the Human Body. By Mrs. Hallock. These are suggestions for a series of *primary* and *intermediate* lessons on the human body. Each portion of the body is taken separately—for instance, the arm, leg, head, and neck, the skin, mouth, eye, nose, and ear—and is worked out in detail, and amply illustrated by examples derived chiefly from the study of well-known animals. There is no better method of teaching such facts and principles than by means of the observation. Mrs. Hallock quotes Ruskin to the effect that "hundreds of people can talk for one who can think, but thousands can think for one who can *see*." The second part consists of lessons on hygienic subjects, such as air, food, water, clothing, and exercise. The book is naturally intended only for teachers, in whose hands it should prove valuable.

LONGMANS, GREEN, AND CO.

Elementary Algebra: Parts I., II., and III. W. G. Constable and J. Mills. A very useful introduction to algebra. The explanations are clear, the examples well graduated and selected.

A Practical Introduction to the Study of Botany: Flowering Plants. By J. Bretland Farmer, M.A. This little book should form an excellent basis for practical class teaching. It contains a great deal of rather closely-packed information, and larger works on botany should be read with it by the private student. In the section on general morphology there seems to be no reason for so soon abandoning the "list of material required" for each chapter,—a list very useful for both teacher and student. The drawings are good and clear, and very serviceable in the case of the less accessible plants. In the section on internal anatomy the directions for preparing specimens are clear and practical. The chapter on the gymnosperm stem requires to be expanded, and illustrated by drawings. The experiments detailed in Part III. form a good introduction to the study of plant physiology. In the section on systematic botany only a few principal groups or orders of flowering plants are dealt with. An appendix enumerates the apparatus and reagents required for the experiments detailed in the book. A number of selected questions from recent Science and Art Department Examinations (Elementary) and Oxford and Cambridge Locals are given. This very useful little work would be the better for a good glossary and a list of drawings.

Cæsar's Gallic War, Book I. Edited by J. W. Bartram, M.A. This is an excellent little edition of the First Book of the *Gallic War*. The introduction comprises a good life of Cæsar, and a full and interesting account of Cæsar's army. The map of Gallia gains in clearness by being coloured. Cæsar's nine campaigns are marked on it. There are four other maps and plans. The notes are clear and not overloaded with detail, and there is a complete vocabulary. A word of praise must be said for the illustrations, which are very attractive, and are not left to explain themselves.

GEORGE PHILIP AND SON.

The Sleigh Bells Musical Drill. By A. Alexander, F.R.G.S. A set of twelve simple exercises, with musical accompaniment, very suitable for use in boys' or girls' schools.

The Diagram Series of Hand Maps. This is a very useful series of maps, in which the outline and principal physical features are shown, the pupil filling in names as necessary. For this purpose they are excellent, except that too many unnecessary details are included.

SWAN SONNENSCHEIN AND CO.

The New Science and Art of Arithmetic. By A. Sonnenschein and H. A. Nesbitt, M.A. This massive treatise on arithmetic calls for a somewhat extended notice on our part; and as the result of the prolonged and careful consideration which we have given to it is by no means in all respects favourable, we will gladly admit that the book is everywhere stimulating to the teacher, and shows on every one of its five hundred pages the mark of experience, and often of originality of method and of conception.

Having said so much, we must protest most strongly against the extraordinarily bad taste manifested in the preface. After claiming for themselves the invention of the rule for the accurate decimalisation of money at sight, they continue: "Other books that have appeared since 1870 have imitated us, but not successfully, as the following examples will show." The first of the examples given is from Pendlebury. Now, as the sum of money which Pendlebury takes is £543, 17s. 6d., which can be *accurately decimalised in three places*, and as the rule for decimalisation of money to *three* places was known before our authors were born, it is not clear where the "imitation" arises. Moreover, Pendlebury has purposely worked his example at full length, to illustrate a rule which he is discussing; and our authors have purposely contracted their work as much as possible, to illustrate the futility of Pendlebury. If Pendlebury's process be contracted to its full extent, it contains no more figures than Sonnenschein's; and since it does not employ the "Italian" method of division, it is somewhat easier to check. It would be easy to show that the attacks which follow—upon Lock, and upon another section of that *bête noire*, Pendlebury—are equally foolish and misleading with that which we have just been examining; but we hold no brief for these authors, and must turn to the book itself. We confess that we find this unbearably "padded," not to say garrulous. Is it for the beginner that the stages of multiplication by 10 are explained in a whole page? (pp. 46, 47). Then that beginner must be a well-educated beginner, for he is expected (p. 46) to know the meaning of the word "nonagon;" and we must sadly confess that the first grown-up person to whom, by way of test, we submitted this word informed us that it was "a person ninety years old." Indeed, throughout the book there is an annoying pedantry. Certain pages are called "Ediscenda," without any explanation of what the word means. Few who know its meaning would need to learn the "Ediscenda" by heart. Those who do not would probably be equally ignorant of the meaning of "pentagon," "perimeter," and the like.

The weights and measures which are given—we believe among the "Ediscenda"—are given without any hint that many of them are obsolete (*dwt., troy lb., cloth measure, apothecaries' wt.*). Surely, too, in a collection which includes the *bale* (how many of our readers know the number of quires in a bale?), the *stone*, the *league*, the *minim*, and the *knot* might also be named.

The section on decimals is one of which our authors seem unusually proud. We freely acknowledge that in their earlier editions they were the first among English books to endeavour to state the laws which govern the curious and interesting properties of these numbers. They claim, rather absurdly, that they were the "first to give the demonstration of Fermat's theorem in an elementary form;" which means little more than that they were the first to rewrite one of the ordinary text-book proofs, substituting 10 for an algebraical symbol. But apart from such pretensions, it is true that they have priority in many respects, and it is therefore the greater pity that they have not produced something more systematic and less disorderly. The table on page 353 is lamentably inexact. The authors seem to have been unaware that such a table had been calculated, fifty years before their first edition, by Burckhardt, and again, more exactly, twenty-six years ago, by Shanks. The number of places in the periods of 163, 227, 277, 331, 359, and 367 is *not* 162, 226, 138, 55, 358, and 122 as stated, but 81, 113, 69, 110, 179, and 366 respectively. Of course the results are not of great importance, but surely a table, of all things, should be scrupulously exact.

The rule for the multiplication of decimals strikes us as unscientific. No account is taken of the decimal point until the answer is reached, and the partial products are therefore deprived of meaning. We are strongly of opinion that this should be arranged so that the decimal points in multiplicand, multiplier, partial products, and final product are in a vertical line. For contracted multiplication, the multiplier is sometimes rewritten and reversed (p. 323), and sometimes not (p. 324)—a procedure quite certain to breed confusion.

We had marked many other points for notice, but must forbear further criticism. There are but few pages with which we should not find some fault or other, and apart altogether from the matter, we regret that more attention was not paid to the typography. This is practically uniform throughout. Little attempt is made to separate the important from the unimportant, and still less to separate the text from the examples. The work has been conscientious, and must have been enormous. Our regret, therefore, is all the greater that we must say in conclusion that the more we examine the book the less inclined we feel to introduce it into any of our classes.

BRITISH MUSEUM 29 MH 1900

APPROVED SCHOOL BOOKS

By Dr. CORNWELL, F.R.G.S.

"We are qualified, by ample trial of the books in our own classes, to speak to their great efficiency and value. We have never known so much interest evinced, or so much progress made, as since we have employed these as our school books."—EDUCATIONAL TIMES.

A SCHOOL GEOGRAPHY. 88th Edition. **3s. 6d.**; or with 30 Maps, **5s. 6d.**
"Very superior to the common run of such books. It contains a good deal of useful matter of a more practical kind than usual, which the exercises are likely to impress on the mind more deeply than by the parrot system."—*Athenæum.*

A SCHOOL ATLAS. Consisting of Thirty Small Maps. A Companion Atlas to the Author's "School Geography." **2s. 6d.**; or **4s.** coloured.

GEOGRAPHY FOR BEGINNERS. 68th Edition. **1s.**; or with 48 pages of Questions, **1s. 4d.** Questions, **6d.**
"A very useful series of educational works, of which Dr. Cornwell is either author or editor. It ('The Geography for Beginners') is an admirable introduction. There is a vast difficulty in writing a good elementary book, and Dr. Cornwell has shown himself possessed of that rare combination of faculties which is required for the task."—*John Bull.*

SPELLING FOR BEGINNERS. A Method of Teaching Reading and Spelling at the same time. 4th Edition. **1s.**

THE SCIENCE OF ARITHMETIC. A Systematic Course of Numerical Reasoning and Computations; with very numerous Exercises. By JAMES CORNWELL, Ph.D., and Sir JOSHUA G. FITCH, LL.D. 20th Edition. **4s. 6d.**
"The best work on arithmetic which has yet appeared. It is both scientific and practical in the best and fullest sense."—*London Quarterly.*

KEY TO SCIENCE OF ARITHMETIC. With the Method of Solution to every Question. **4s. 6d.**

ALLEN & CORNWELL'S SCHOOL GRAMMAR. 64th Edition. **2s.** red leather; or **1s. 9d.** cloth.
"The excellence of the grammar published by the late Dr. Allen and Dr. Cornwell makes us almost despair of witnessing any decided improvement in this department."—*Athenæum.*

GRAMMAR FOR BEGINNERS. An Introduction to Allen and Cornwell's "School Grammar." 87th Edition. **1s.** cloth; **9d.** sewed.
"This simple Introduction is as good a book as can be used."—*Spectator.*
☞ *The Book is enlarged by a Section on Word-building, with Exercises for Young Children.*

THE YOUNG COMPOSER. Progressive Exercises in English Composition. 48th Edition. **1s. 6d. Key, 3s.**
"The plan of the work is very superior. We are persuaded this little book will be found valuable to the intelligent instructor."—*Westminster Review.*

POETRY FOR BEGINNERS. A Selection of Short and Easy Poems for Reading and Recitation. 13th Edition. **1s.**

SCHOOL ARITHMETIC. 18th Edition. **1s. 6d. Key, 4s. 6d.**
"Eminently practical, well stored with examples of wider range and more varied character than are usually given in such books, and, its method of treatment being thoroughly *inductive*, it is pre-eminently the book for general use."—*English Journal of Education.*

ARITHMETIC FOR BEGINNERS. Combines simplicity and fullness in teaching the First Four Rules and Elementary Fractions. 9th Edition. **1s.**

London: SIMPKIN, MARSHALL, HAMILTON, KENT, & CO., LIMITED. Edinburgh: OLIVER & BOYD.

ARMSTRONG'S DRAWING SCHOOL.

23 The Avenue, Bedford Park, London, W.

CORRESPONDENCE DEPARTMENT.

Courses for all Drawing Examinations.

Thorough guidance, and criticism of all drawings, by **Mr. C. ARMSTRONG,** Late **Head Art Master, City of London School of Art,** and Cusack Institute; **Trained Teacher,** Education Department's Certificate; **Trained Art Master,** Royal College of Art, Art Department's Certificate; an **Examiner** to the Art Department; **Author** of the well-known text-books—Cusack's "Shading," "Model," and "Freehand Ornament;"

And with ten years' experience in teaching drawing by Correspondence.

Just Published, SECOND Edition, with numerous Illustrations and additional chapters. Crown 8vo. 5s. net.

MENTALLY-DEFICIENT CHILDREN: Their Treatment and Training. By G. E. SHUTTLEWORTH, B.A., M.D., etc.; Medical Examiner, Defective Children, School Board for London; late Medical Superintendent, Royal Albert Asylum for Idiots and Imbeciles of the Northern Counties, Lancaster; formerly Assistant Medical Officer, Earlswood Asylum.

"The book is an admirable manual on the subject of which it treats, and calls for careful study by all dealing with the education and training of feeble-minded children."—SCHOOL BOARD GAZETTE.

London: H. K. LEWIS, 136 Gower Street, W.C.

NELSON'S SCIENCE TEXT-BOOKS
AND
STANDARD EDUCATIONAL WORKS
FOR TEACHERS AND PUPIL TEACHERS.

BROOK'S DESCRIPTIVE GEOGRAPHY. By SAMUEL BROOK, Head-master Senior Practising Schools, Westminster Training College. Eighth Edition. Thoroughly Revised and Improved. New Matter—New Maps—New Type. With Diagrams and Illustrations. 3s. 6d.
A new edition of this well-known Geography having been called for, the opportunity has been taken to have the book revised and brought up to date by alteration, rearrangement, or addition of matter where necessary, and by preparing new maps. New type of great clearness has been used throughout.

DOMESTIC ECONOMY FOR SCHOOLMISTRESSES. Revised and adapted by J. C. HORDIX, M.A., Principal Cavendish College, Cambridge, to meet latest requirements of Pupil Teachers', Scholarship, Certificate, Elementary Hygiene, and Cookery Examinations. Profusely Illustrated. 403 pages. New Edition. Price 2s. 6d.

MENTAL SCIENCE, LOGIC AND ETHICS FOR TEACHERS. By THOMAS CARTWRIGHT, B.A., B.Sc. (Lond.). New and Enlarged Edition. 203 pages. Price 2s. 6d.

AN ELEMENTARY COURSE IN PRACTICAL PHYSICS. By F. CASTLE, M.I.M.E. With many Illustrations and Diagrams. 226 pages. Crown 8vo, cloth extra. Price 2s.

"SECTION ONE" PHYSIOGRAPHY. By THOMAS CARTWRIGHT, B.A., B.Sc. (Lond.); Head-master Finchley Organised Science School; Lecturer in Chemistry to the Middlesex County Council; Late Lecturer in Physiography to the Birkbeck Institution, Chancery Lane, E.C., etc., etc. 208 pages. Illustrated. Price 2s.

GREGORY'S ELEMENTARY PHYSIOGRAPHY. By RICHARD A. GREGORY, Oxford University Extension Lecturer; Fellow of the Royal Astronomical Society, etc., etc. With an Appendix by THOMAS CARTWRIGHT. Price 2s. 6d.

GREGORY'S ADVANCED PHYSIOGRAPHY. By R. A. GREGORY, and J. C. CHRISTIE, Lecturer in Geology at the Glasgow and West of Scotland Technical College. A new and revised Edition, with Supplementary Matter by THOMAS CARTWRIGHT. Price 4s.

GREGORY'S HONOURS PHYSIOGRAPHY. By R. A. GREGORY, and H. G. WELLS, B.Sc. (Lond.), Lecturer in Geology at the University Tutorial College; Fellow and Doreck Scholar of the College of Preceptors, etc., etc. Price 6s.

PHYSICAL AND ASTRONOMICAL GEOGRAPHY. By R. A. GREGORY, author of "Elementary Physiography." Specially designed for Pupil Teachers and Scholarship and Certificate Candidates. With Original Illustrations. Seventh Edition. Crown 8vo. Cloth extra. Price 3s. 6d.

PUPIL TEACHERS' AND SCHOLARSHIP SCHOOL MANAGEMENT. By A. T. FLUX. Eighth Edition, Revised. Price 1s. 6d.

Books prescribed for Scholarship and Certificate Examinations.
Specially Edited and Annotated for Pupil Teachers and Students.

UN PHILOSOPHE SOUS LES TOITS (Emile Souvestre). A Juxtalinear Translation. With Hints to Students, Explanatory Notes, etc. By A. D. J. BARRIBAL, B.A., Lecturer in French, Wesleyan Training College, Westminster. Price 2s.

VOYAGE AUTOUR DE MA CHAMBRE (Xavier de Maistre). With Introduction, Notes, and Exercises. By GEORGE COLLAR, B.A., B.Sc., Head-master of Stockwell Pupil-Teacher Centre. Price 1s. net.

A NEW ELEMENTARY FRENCH COURSE. Specially designed for Young Students, Pupil Teachers, and Queen's Scholarship Candidates. By F. E. DARQUÉ. Fourth Edition. Price 2s.

LA JEUNE SIBERIENNE (Xavier de Maistre). A Juxtalinear Translation, with Notes by F. E. DARQUÉ. Fourth Edition. Price 2s.

PLINY'S LETTERS, I. to XII. With Introduction, Text, Notes, Translation, Vocabulary, and Examination Papers. Edited by W. J. WESTON, B.A. Price 1s. net.

T. NELSON & SONS, 35 and 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

The Royal School Series.

Self-Preparation in the New Freehand for May Exams.

PHOTOGRAPHIC REPRESENTATIONS OF CASTS.

By B. C. HASTWELL,

Art Master, Pupil Teachers' Schools, London School Board.

In One Packet, containing Twelve Sheets, price 2s. 6d.

Each Sheet contains—

(*a*) **Photographic Representation of Cast.**
(*b*) **Key Sketch in Outline.**
(*c*) **Finished Sketch in Outline.**

With Practical HINTS, NOTES, etc., to Students.

*** *Prospectus, with Specimen of Sheet, post free on application.*

*** *FOR THE ALTERNATIVE COURSES IN*

GEOGRAPHY AND HISTORY.

For Schools which take other Class Subjects in the lowest three Standards.

THE ROYAL OSBORNE GEOGRAPHY READERS.

Well Planned. Brightly Written. Carefully Graduated.

With Spelling Lists, Summaries, Notes and Meanings, and beautiful Illustrations.

Book IV. (for Standard IV.). **Sea and Land.** 253 pages, cloth boards. Price 1s. 3d. [*Ready.*

Will be found an admirable introduction to Geography. Thoroughly interesting, profusely illustrated.

"Clear and simple, an excellent Reader."—*Educational News.*

Book V. (for Standard V.). **Great Britain and Ireland.** 292 pages, cloth boards. Price 1s. 6d. [*Ready.*

Book VI. (for Standard VI.). [*In preparation.*

THE ROYAL WINDSOR HISTORY READERS.

BEAUTIFULLY ILLUSTRATED. Now Ready.

No. I. (for Standard IV.). **Stories and Biographies from British History, 55 B.C. to 1603 A.D.** Price 1s. 3d.

No. II. (for Standard V.). **Stories and Biographies from 1603 to the Present Time.** Price 1s. 6d.

No. III. (for Standards VI. and VII.). **The Reign of Queen Victoria—Growth of the Empire.** Price 1s. 8d.

A sound, bright, and clear History of our Own Times. Complete to the end of the year 1898.

"Alike in its external, its general appearance and contents, it takes the eye and compels praise....The matter of the book is judiciously chosen. We are constrained to envy the happy youngster whose good fortune it is to learn the recent history of our country from this book."—*Schoolmaster.*

*** *A Specimen free to Head-teachers.*

NELSON'S SUPPLEMENTARY READERS.

Specially Edited. Specially Annotated. Specially Cheap.

Providing a Wide Range and Variety of Good Reading. With Illustrations. Price 3d. each; or in limp cloth, 4d. each.

1. **The Story of the North-East Passage.**
2. **The Story of the North-West Passage.**
3. **Richard of the Lion Heart.** Adapted from Sir WALTER SCOTT'S "Talisman."
4. **Animal Stories.** (Standards III. and IV.)
5. **Gulliver's Voyage to Lilliput.**
6. **Settlers at Home.** By HARRIET MARTINEAU.
7. **Nelson of the Nile.** From SOUTHEY.
8. **Old Greek Stories.** From "The Tanglewood Tales."
9. **Little Nell.** From DICKENS'S "Old Curiosity Shop."

ROYAL COPY BOOKS.

NELSON'S ROYAL COPY BOOKS. With Cut Headlines. Civil Service Style. 24 Nos. 2d. each.

NELSON'S ROYAL STAR COPY BOOKS. Two Headlines on a Page. 13 Nos. 2d. each.

NELSON'S ROYAL UPRIGHT COPY BOOKS. With Cut Headlines. 10 Nos. 2d. each.

NELSON'S ROYAL PENNY COPY BOOKS. Civil Service Style. 12 Nos. 1d. each.

*** *Prospectus, with Specimen Pages, post free on application.*

JUST PUBLISHED.

FIRST LESSONS IN ENGLISH GOVERNMENT.

An Easy Introduction to the Law and Custom of the Constitution. With many Illustrations. Cloth boards. Price 1s. 6d.

This is a Citizen Reader of the best type, well arranged, well worked out on the historical method, and written in a simple and interesting style. It is capitally illustrated, and is furnished with a Glossary of Technical Terms. The book is admirably suited for Evening Continuation Students, Candidate Pupil Teachers, the highest class in the Elementary School, or lower forms of the Secondary School.

"UP TO LONDON TO SEE THE QUEEN."

A Continuous Story-Reader for the "Sixes." Being No. 1 of "Nelson's Supplementary Infant Readers." Four Coloured and many other Illustrations. Cloth. Price 6d.

This interesting story will be sure to appeal to the little ones. It is specially written for children, and is carefully graduated in difficulty.

THE ROYAL KINDERGARTEN COPY BOOKS.

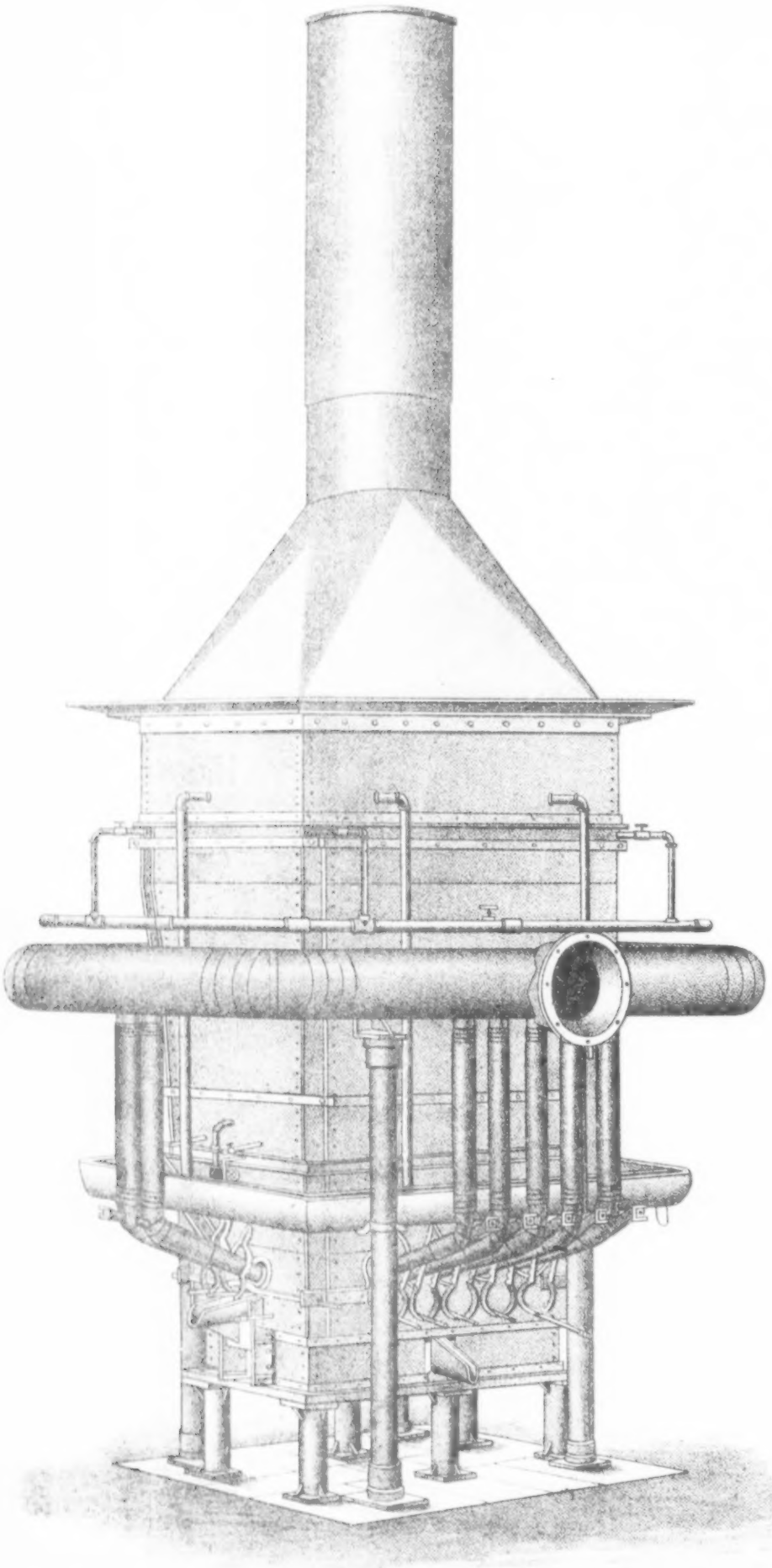
For Pencil Tracing. Eight Books. Sixteen Pages. Price 1d. each.

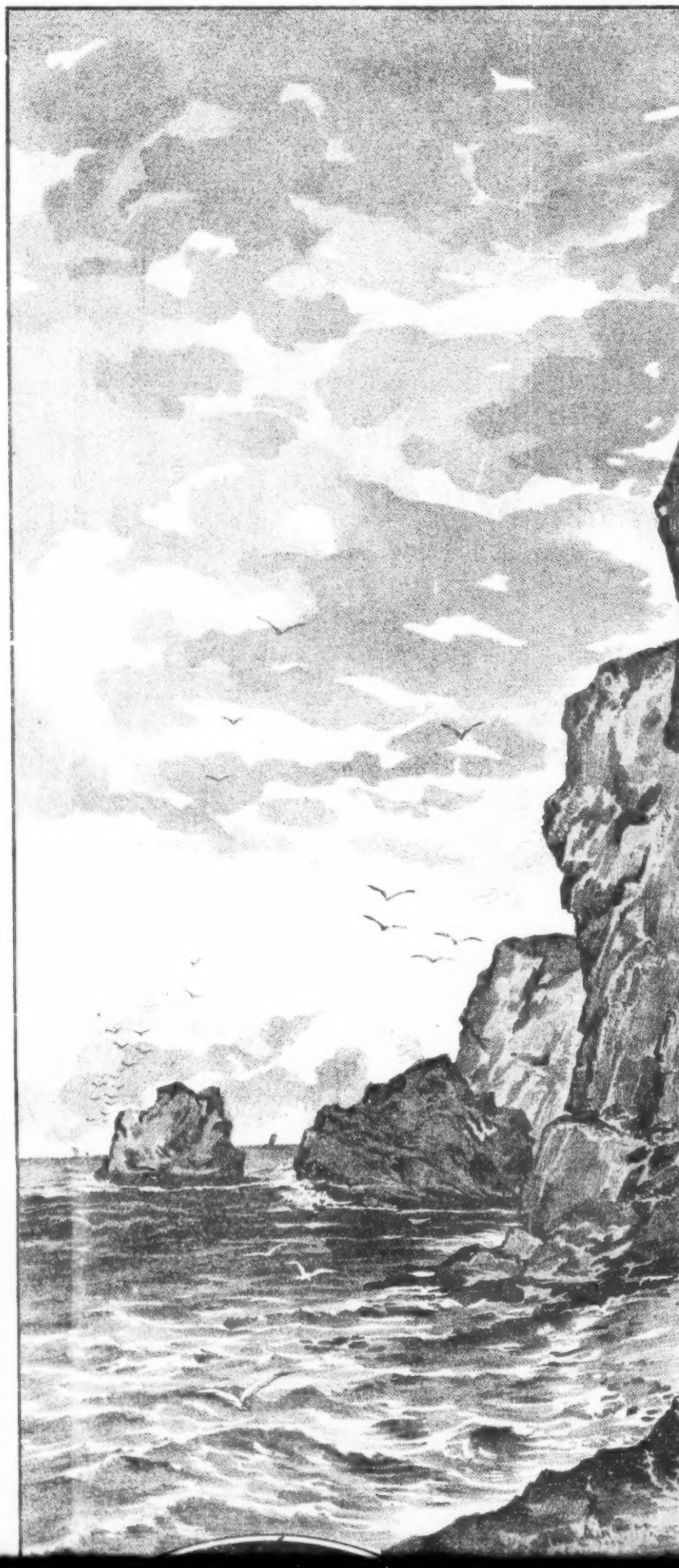
The best thing yet produced for Infant Schools and Kindergarten.

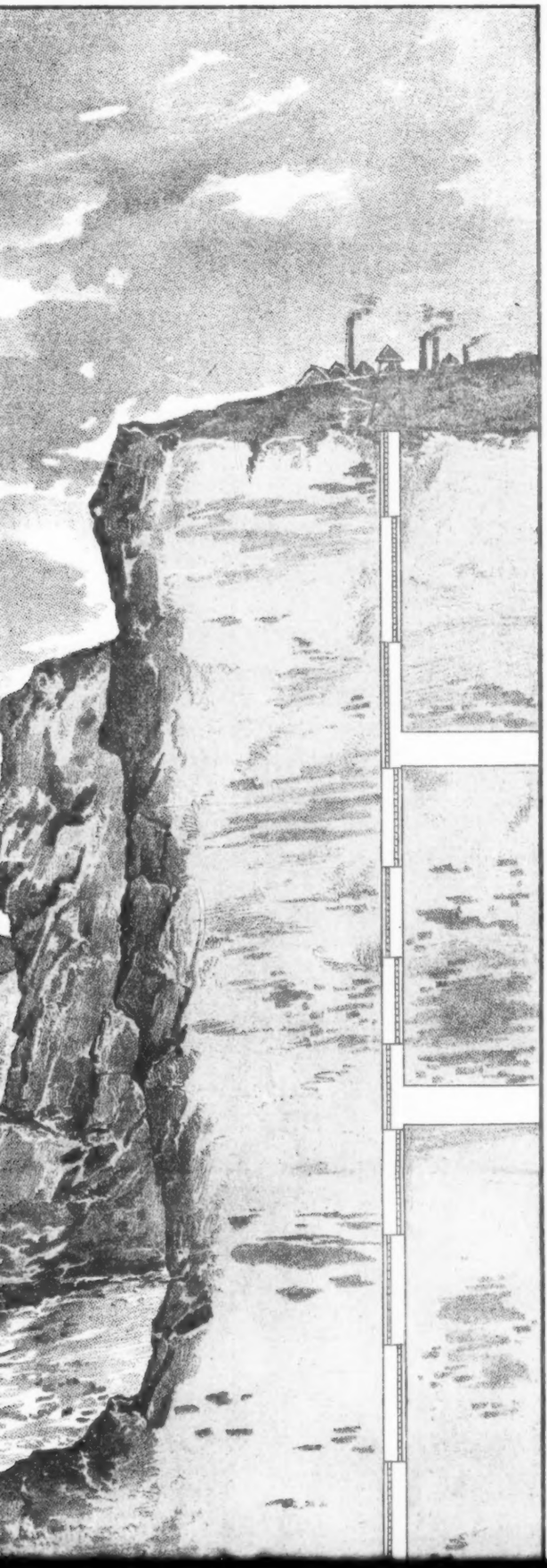
These books mark a new departure in the teaching of writing to young children. Every letter is traced throughout, but printed in a soft blue tint instead of the dotted black line commonly used. The paper is specially selected for lead-pencil work.

T. NELSON AND SONS, 35 and 36 Paternoster Row, London, E.C.; Parkside, Edinburgh; and New York.

OBJECT LESSON SUPPLEMENT—PRESENTED

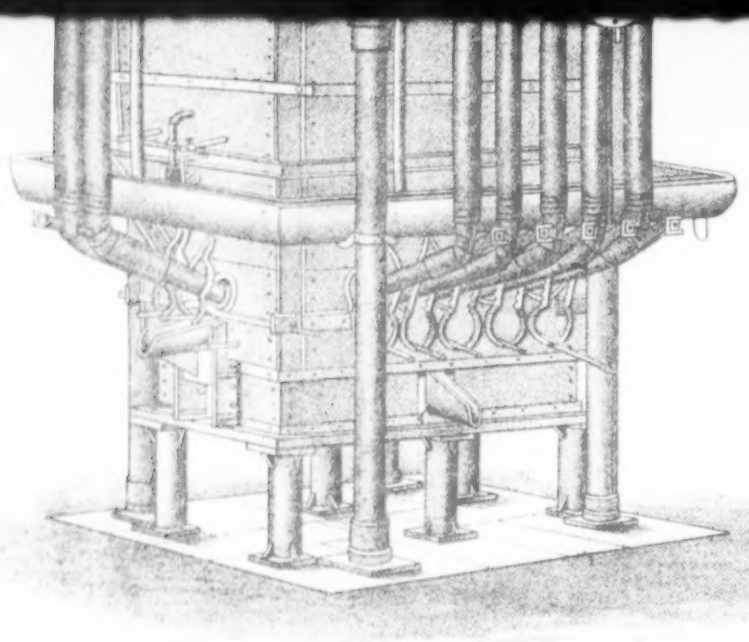




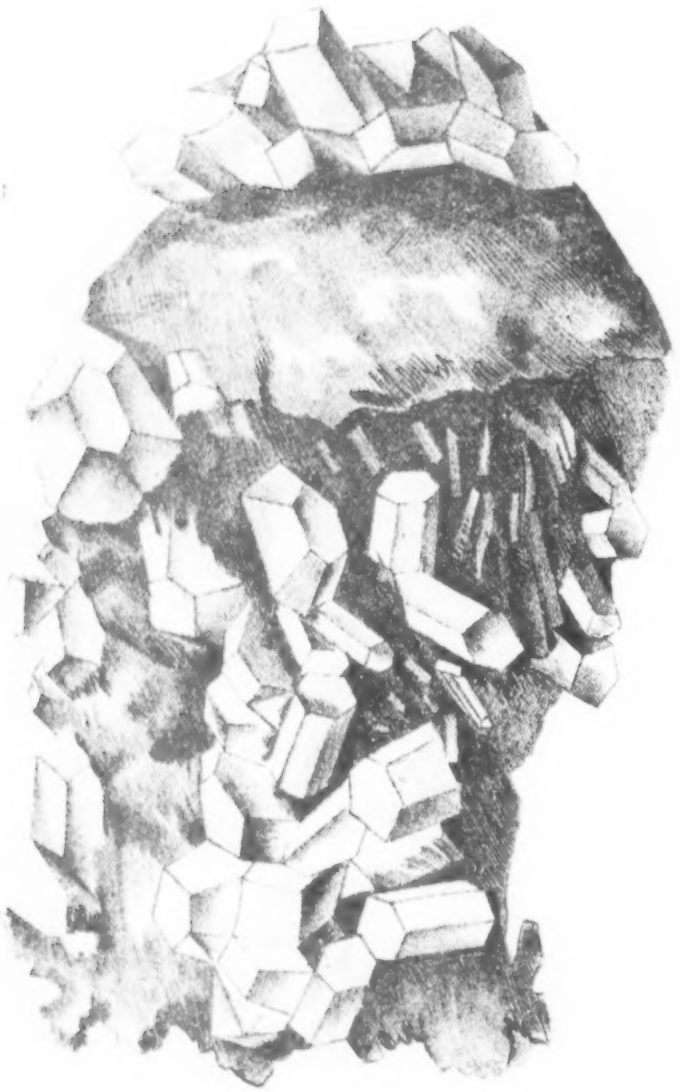


VICTORIA·DEI·GRA·BRITT·REGINA·FID·DEF
IND·IMP·

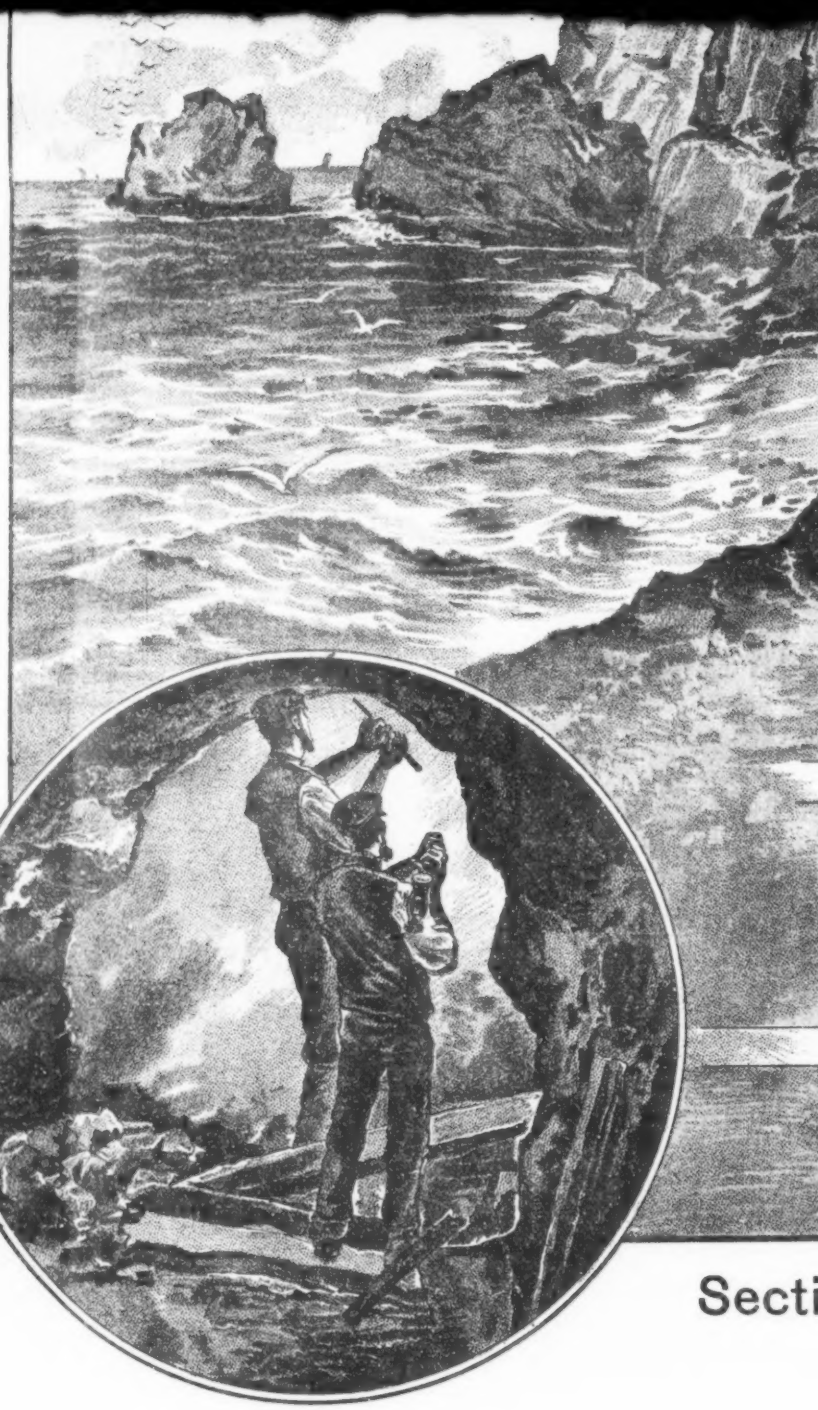
ONE PENN



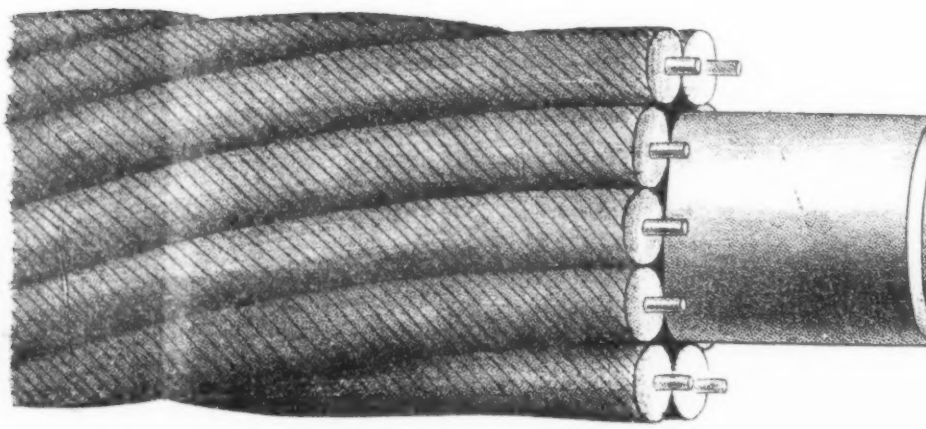
Copper Furnace.



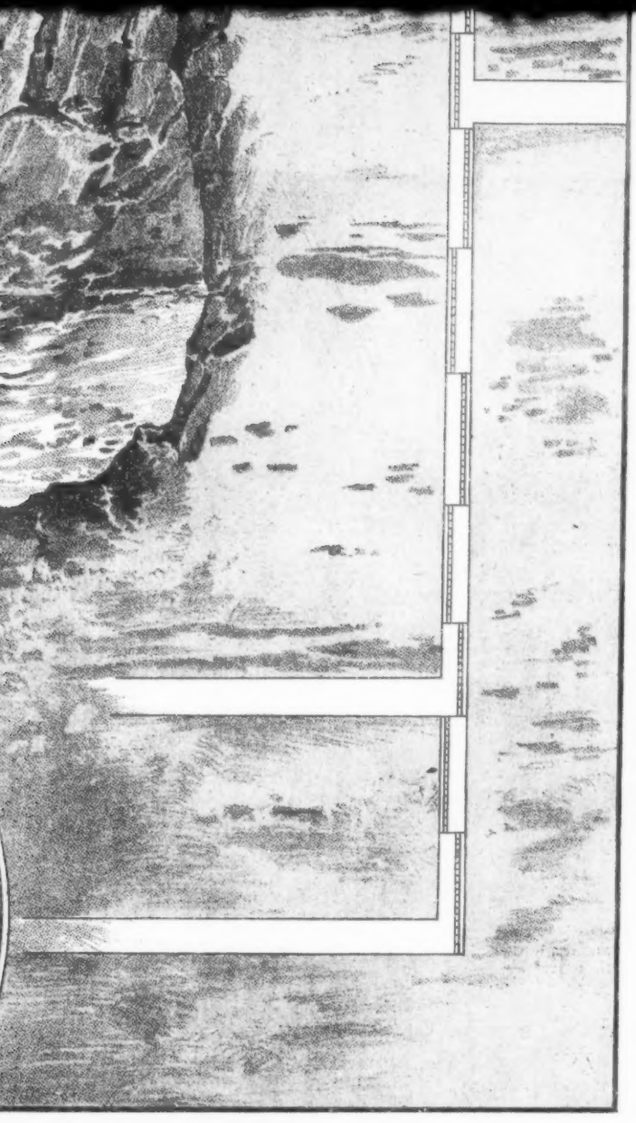
Copper Ore.



Miners at Work.

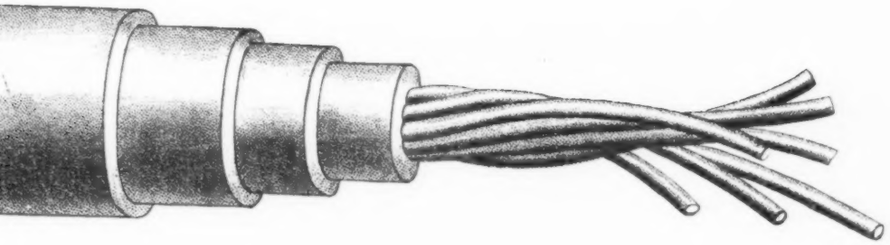


Telegraph Cable, Copper Wires

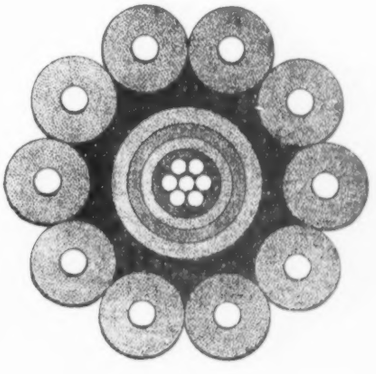


Section of Copper Mine
(Cornwall).

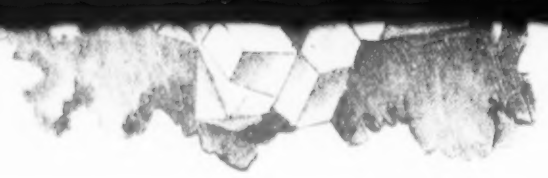
Bronze Coin.



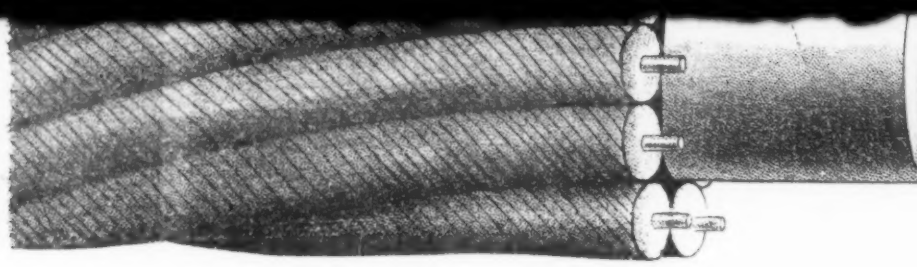
Wires in centre.



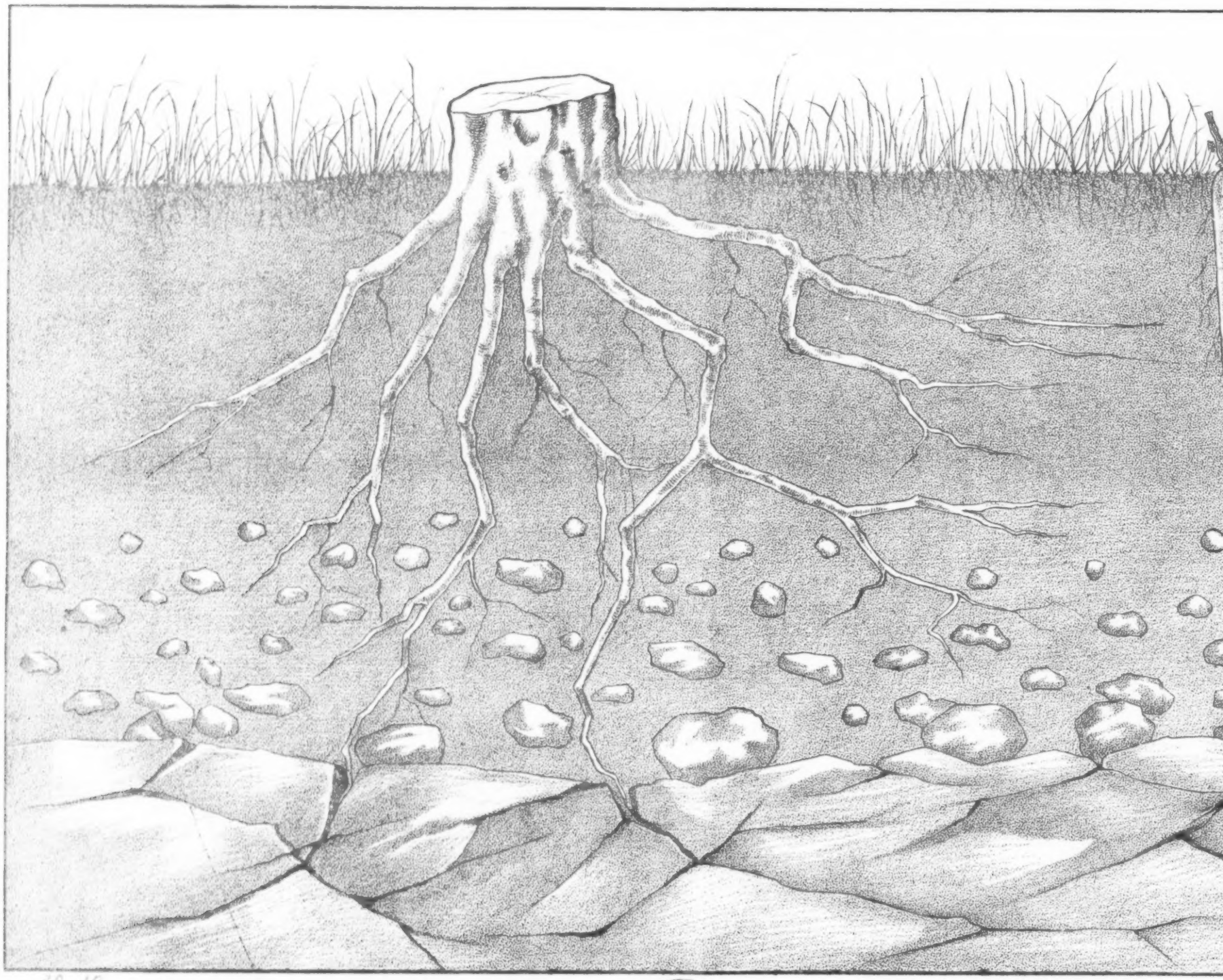
Section.



Copper Ore.



Telegraph Cable, Copper Wire

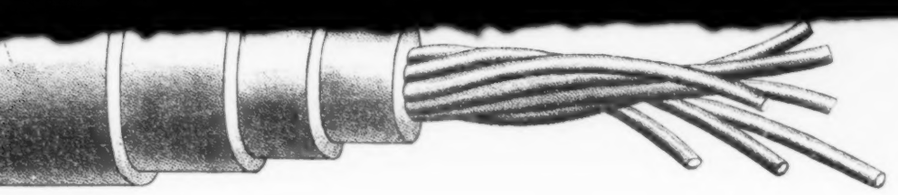


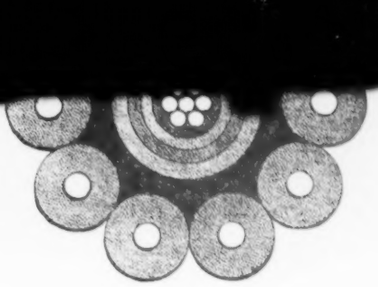
BRITISH MUSEUM 29 MR 1900

Soil and Subsoil

COPPER AND T

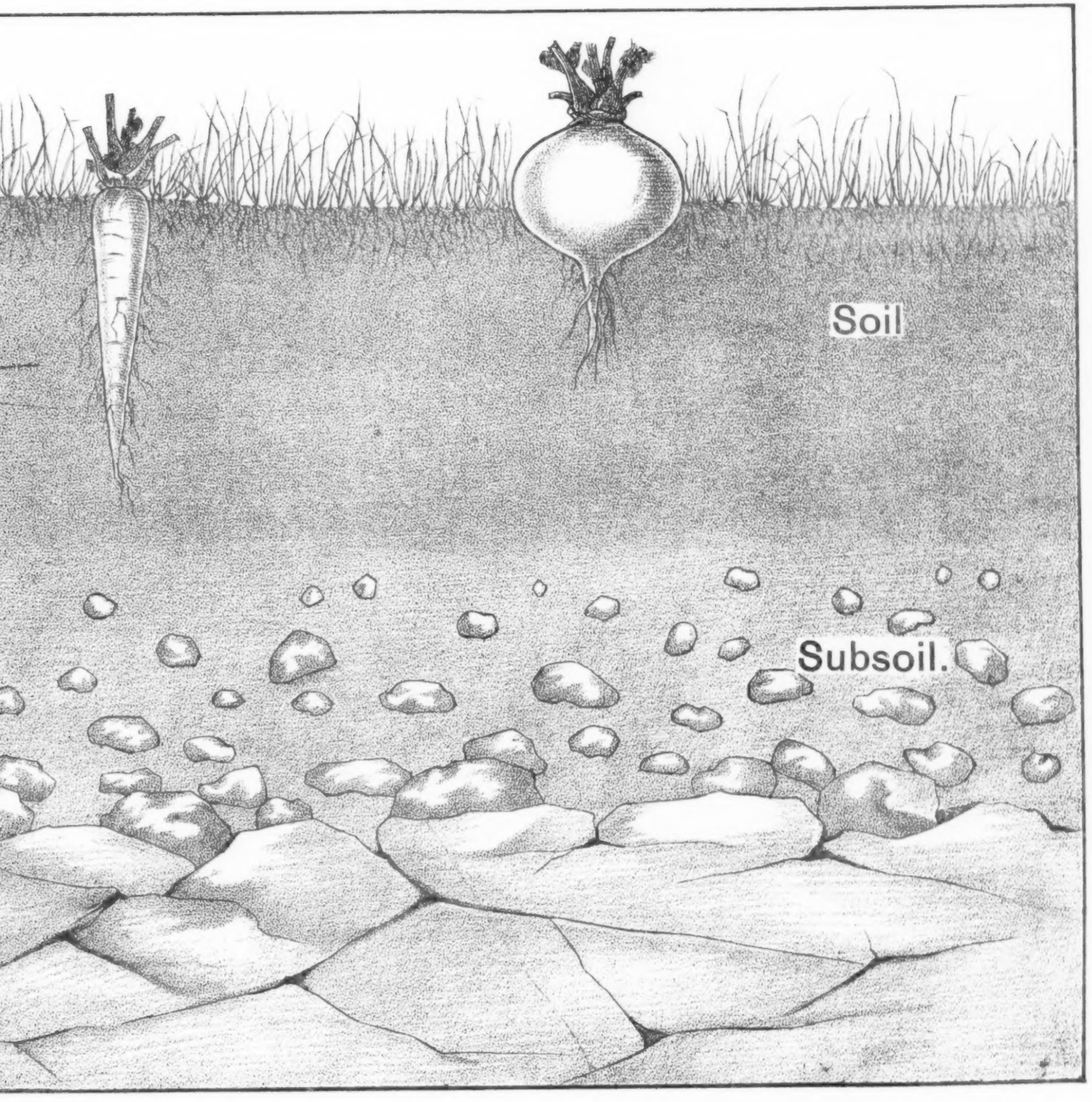
Published at the Office of THE PRACTICAL TEACHER, S





Wires in centre.

Section.



ubsoil.

THE SOIL.

ACHER, 33 Paternoster Row, London, E.C.

The Royal School Series.

BEAUTIFULLY ILLUSTRATED.

THE ROYAL SCIENCE READERS.

A Graded Series of Object Lessons.

Exactly meeting the requirements of the New Code, both in the Obligatory Subject, "Object Lessons," and in the Class Subject, "Elementary Science."

BOOK I.—"Clear in style, and the matter accurate."—*School Guardian.*

BOOK II.—"Can be strongly recommended."—*Teachers' Aid.*

BOOK III.—"Excellent alike in conception and execution."—*Schoolmaster.*

May be used as General Readers, Science Readers, or Object Lesson Readers.

BOOK I.—For Standard I. Beautifully Illustrated, and containing Thirty Lessons, Poetry for Recitation, Summaries, and Word Lists. 128 pages. Cloth boards, 9d.

BOOK II.—For Standard II. Beautifully Illustrated, and containing Poetry for Recitation, Word Lists, Exercises on the Lessons, etc., etc. 146 pages. Cloth boards, 10d.

BOOK III.—For Standard III. Beautifully Illustrated, and containing Poetry for Recitation, Word Lists, Exercises on the Lessons, etc., etc. 177 pages. Cloth boards, 1s.

TEACHERS' HANDBOOK, to accompany the above Readers, containing Notes on Apparatus, Summaries of Lessons, and Blackboard Outlines. Interleaved with Writing Paper for Notes. Cloth boards, 1s. 6d.

JUST PUBLISHED.

ROYAL SCIENCE READERS WALL SHEETS.

Illustrations for the Lessons in the "Royal Science Readers."

Now Ready.

FIRST SERIES. For Book I.

22 Sheets mounted on One Roller.
Illustrations printed in Tints.
Size of Sheets, 21 inches by 31½ inches.

Price 10s. 6d. per Set.

Or separately, eyeletted at corners, 1s. each.

CONTENTS.

1. THE HOLLY (Lesson 1). WOOD (Lesson 16).
2. THE CANARY (Lesson 2). COCKS AND HENS (Lesson 20).
3. THE LEAD PENCIL (Lesson 3). BLACK LEAD (Lesson 4).
4. THE COW (Lesson 5).
5. WATER (Lesson 6).
6. THE GOLD FISH (Lesson 7). THE HERRING (Lesson 25).
7. PUTTY (Lesson 8).
8. SEEDS (Lessons 9 and 10).
9. AIR (Lesson 11).
10. THE CAT (Lesson 12).
11. IRON (Lesson 13).
12. TEA (Lesson 14).
13. SNOW (Lesson 15). ICE (Lesson 18).
14. THE RABBIT (Lesson 17).
15. COTTON (Lesson 19).
16. SLATE (Lesson 21).
17. WHEAT (Lesson 22).
18. THE PERIWINKLE (Lesson 23). THE SHRIMP (Lesson 27).
19. GREEN PEAS (Lesson 24). THE POTATO (Lesson 30).
20. THE BUTTERCUP (Lesson 26).
21. SALT (Lesson 28).
22. THE FLY (Lesson 29).

Now Ready.

SECOND SERIES. For Book II.

20 Sheets mounted on One Roller.
Illustrations printed in Tints.
Size of Sheets, 21 inches by 31½ inches.

Price 10s. 6d. per Set.

Or separately, eyeletted at corners, 1s. each.

CONTENTS.

1. THE SNAKE (Lesson 1).
2. CORK (Lesson 2).
3. THE PIGEON (Lesson 3). THE SPARROW (Lesson 12).
4. BARLEY (Lesson 4). CABBAGE (Lesson 30).
5. STEAM (Lesson 5).
6. THE SHEEP (Lesson 6).
7. A PENNY (Lesson 7). LEAD (Lesson 9).
8. THE HORSE (Lesson 8).
9. SUGAR (Lessons 10 and 11).
10. CLAY (Lesson 13). BRICK (Lesson 14).
11. THE SOLE (Lesson 15). THE OYSTER (Lesson 23). THE CRAB (Lesson 24).
12. COFFEE (Lesson 16).
13. THE DOG (Lessons 17 and 18).
14. CHESTNUTS (Lesson 19).
15. STONE (Lesson 20).
16. COAL (Lesson 21).
17. THE APPLE (Lesson 22). THE PRIMROSE (Lesson 26).
18. NEEDLES AND PINS (Lesson 25).
19. SULPHUR (Lesson 27).
20. THE CATERPILLAR (Lesson 28). THE BUTTERFLY (Lesson 29).

Now Ready.

THIRD SERIES. For Book III.

20 Sheets mounted on One Roller.
Illustrations printed in Tints.
Size of Sheets, 21 inches by 31½ inches.

Price 10s. 6d. per Set.

Or separately, eyeletted at corners, 1s. each.

CONTENTS.

1. THE SNOWDROP (Lesson 1). THE ONION (Lesson 5). THE HYACINTH (Lesson 8).
2. THE DONKEY (Lesson 2).
3. THE COCOA-NUT (Lesson 3). COCOA AND CHOCOLATE (Lesson 25).
4. COPPER (Lesson 4). THE SOIL (Lesson 20).
5. EGGS AND CHICKS (Lesson 6).
6. WOOL (Lesson 7). LEATHER (Lesson 17).
7. THE PLAICE (Lesson 9). THE FROG (Les. 33).
8. EVAPORATION (Lesson 10). CONDENSATION (Lesson 28). CLOUDS AND RAIN (Les. 29).
9. THE CHERRY TREE (Lesson 11). THE OAK TREE (Lesson 30).
10. THE SPIDER (Lesson 12). THE BEE (Les. 24).
11. GLASS (Lesson 13).
12. THE DANDELION (Lessons 14 and 15). VIOLETS AND PANSIES (Lesson 18).
13. THE MOUSE (Lesson 16). THE HEDGEHOG
14. PAPER (Lesson 21). [(Lesson 19).
15. THE SNAIL (Lesson 22). THE EARTHWORM (Lesson 27).
16. THE SENSES (Lesson 23). THE BODY (Lessons 36 and 37).
17. SUN, MOON, AND STARS (Lesson 26).
18. MILK (Lesson 31).
19. MATCHES (Lesson 32). BELLOWS (Lesson 34).
20. FLOUR AND BREAD (Lesson 35).

*** These Sheets have been prepared specially to facilitate the giving of Object Lessons in connection with the ROYAL SCIENCE READERS. They provide, in an attractive and handy form, abundant material for this purpose, the Series covering an exceptionally varied range of subjects.

"Will afford abundant and suitable material for Object Lessons."—Schoolmaster.

THE ROYAL CROWN READERS.

With Beautiful Coloured Illustrations.

STANDARDS 0 and I. to VI.

With Primers, Infant Readers, Wall Sheets, and Word-Building Sheets.

ROYAL PORTFOLIO OF PICTURES AND DIAGRAMS

For Object Lessons.

Beautifully printed in Colours or Tints.

NATURAL HISTORY.—Three Series. PLANT LIFE.—Six Series.

*** *Full List with prices on application.*

THE ROYAL CROWN INFANT SCHOOL SERIES.

With Beautiful Coloured Illustrations.

PRIMER No I., 2d. & 3d.; II., 3d. & 4d.
INFANT READER I., 6d.; II., 6d.
STANDARD 0, 7d.
Wall Sheets, 2 Sets.
Word-Building Sheets, 1 Set.

Full Particulars, or a Specimen Copy, post free to Head Teachers.

London: THOMAS NELSON & SONS, 35 and 36 Paternoster Row, E.C.; Parkside, Edinburgh; and New York.

SINGER'S . .

SEWING. . .

MACHINES.

Have been
supplied to over
450 SCHOOLS
throughout the
Country,
and the Pupils are thus
TAUGHT FREE
a most useful Occupation.

EVERY
MODERN SCHOOL
SHOULD TAKE
ADVANTACE
OF THIS
EXCEPTIONAL
OPPORTUNITY.

MACHINES
OF
ANYBODY'S
MAKE
REPAIRED
OR
EXCHANGED.

SO SIMPLE THAT A LITTLE CHILD CAN WORK IT.

Inquire at any of our Branches, or of any of our Representatives, regarding our
NEW MACHINE INSURANCE, and **OTHER BENEFITS.**

Arrangements can be made for a complete course of lessons to be given on the Sewing Machine, either in Plain Sewing or Art Embroidery, by a capable Instructress, **FREE,** to the Pupils of any School possessing a **SINGER'S SEWING MACHINE.**

WE NEITHER MAKE NOR SELL CYCLES OF ANY KIND.

Beautiful Pictures, showing the various Costumes worn in Foreign Countries, sent FREE
to any School on application to

THE SINGER MANUFACTURING CO.

Management for Great Britain and Ireland:— 42 & 43 ST. PAUL'S CHURCHYARD, LONDON, E.C.

BRANCH OFFICES ALL OVER THE WORLD.

COUPON
PRACTICAL TEACHER
April 1900.

PRINTED AND PUBLISHED BY THOMAS NELSON & SONS, PROPRIETORS, AT THE OFFICE OF "THE PRACTICAL TEACHER," 35 & 36 PATERNOSTER ROW, LONDON, E.C.

BRITISH MUSEUM 29 MR 1900